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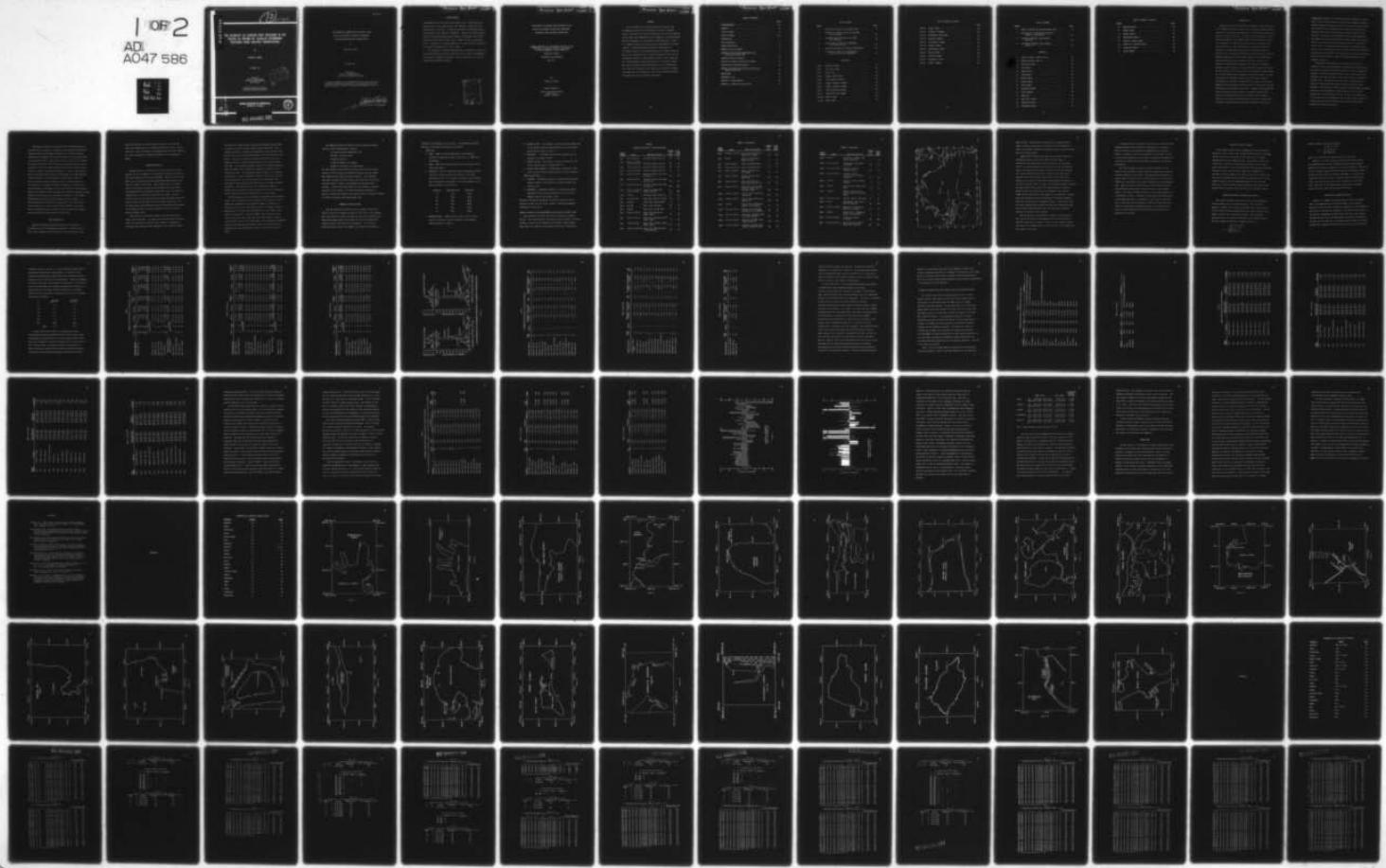
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# THE ACCURACY OF CHARTED PORT POSITIONS IN THE PACIFIC AS DEFINED BY SATELLITE DETERMINED POSITIONS USING MULTIPLE OBSERVATIONS

By

VALERIE M. HANNA

OCTOBER 1977

Prepared for  
OFFICE OF NAVAL RESEARCH  
under Contract N00014-75-C-0209,  
Task 2-C (gravity)

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Valerie M. Hanna

October 1977

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Office of Naval Research  
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\* A thesis submitted to the Graduate Division of the University  
of Hawaii in partial fulfillment of the requirements for the  
degree of Master of Science in Geology and Geophysics, May 1977.

*Charles E. Shelly*  
Director  
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See 1473

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THE ACCURACY OF CHARTED PORT POSITIONS IN THE  
PACIFIC AS DEFINED BY SATELLITE DETERMINED  
POSITIONS USING MULTIPLE OBSERVATIONS

A THESIS SUBMITTED TO THE GRADUATE DIVISION OF THE  
UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT  
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MAY 1977

By

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Simo H. Laurila, Chairman  
John C. Rose  
George P. Woppard

ABSTRACT

As a by-product of the marine scientific program on the oceanographic cruises of the University of Hawaii's research vessels, positions for 34 dock or anchorage sites in and around the Pacific basin were determined using the Magnavox 702 CA (MX 702/hp) Satellite Navigator as a fixed point positioning device. While it is apparent that not all positions were determined to the same accuracy, a significant number represent improvements of 15 seconds or more in the charted positions of islands, ports and harbors in the Pacific basin. Thus this work may prove to be of considerable benefit by establishing a network of well known and well surveyed Doppler determined positions in the Pacific which may serve as geodetic position references. More fundamentally, this study will contribute to the safety of navigation in making land approaches by providing more modern and accurate positional information than can be obtained from charts.

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## INTRODUCTION

The Navy Navigation Satellite System (NNSS), often referred to as the TRANSIT system, has been used as a primary navigation system aboard the oceanographic research vessels of the Hawaii Institute of Geophysics (HIG) since 1970. The first satellite navigation system used was a Magnavox 702 CA (MX/702/hp) Satellite Navigator, which was furnished HIG in 1969 by the Office of Naval Research of the United States Navy. The system first saw sea duty aboard the Institute's oceanographic research ship R/V Mahi from April to December 1970. In December 1970 when the R/V Mahi was retired, the system was transferred to the newly acquired R/V Kana Keoki and remained aboard that vessel through July 1976, when it was temporarily replaced with a Magnavox 702 system. The material reported in this thesis was all taken with the Magnavox 702 system and the study has its foundation in the test program conducted prior to the first voyage of the navigator aboard the R/V Mahi. In this test program the MX/702/hp system was used to make continuous observations at dock side in Honolulu over a period of 16 days and Daugherty (1974a) performed an analysis of the 79 satellite position determinations taken during this period. Daugherty determined that despite occasional erratic values, a remarkably precise mean position (standard deviation of 1.63 seconds of arc, standard deviation of the mean of 0.185 second of arc) could be determined by simple arithmetical averaging without editing of the data or

a posteriori updating of the satellite orbital parameters. On the basis of this initial testing of the satellite navigation system at Honolulu Daugherty proposed the idea of using the system as a point positioning device for various ports visited by the Institute's research vessels about the Pacific as a means to improve charted positions. That there is considerable need for such information was brought out in World War II when isolated islands in the South Pacific were reported as having charted positions as much as 20 miles in error. The results from an initial evaluation of data taken at nine port docking sites in the Pacific basin were presented by Daugherty at the December 1972 meeting of the American Geophysical Union and later published as Part I of Technical Report HIG-74-1 (Daugherty, 1974b).

The present study represents a continuation of the work referred to above, and incorporates an improvement in that the data are edited as suggested by Daugherty (1974b). Also the coverage is expanded to include 22 different ports. Some of these ports were occupied at the same locations several times and also at different docking sites. Also presented in this paper in Appendix A are charts for each docking site based on the latest and best maps available. The data were reduced using the same arithmetic averaging procedure used by Daugherty (1974a, 1974b) in order to permit comparisons with his unedited results. As some of the data used are the same as used by Daugherty there is some overlap between the results presented in this paper and the previous ones given by Daugherty and referred to above.

That there are other more precise methods of handling the data than arithmetic averaging is recognized. For example, Woppard and Thompson (1974) used a graphical approach for refining positions obtained with a Magnavox 706 satellite receiver system at land based sites in South America. Berg (1975, 1976) has shown that the double pass method of Anderle (1971) with antenna height corrections based on Stansell (1970) can yield highly refined positions (approximately 8 meters or better in position coordinates). However, the improvement in positions using these more sophisticated time consuming and expensive methods is not sufficient to significantly affect the basic conclusions reached regarding errors in charted positions. For example, if a comparison is made of coordinates for Pier 18 in Honolulu Harbor as determined in this study with those determined by Woppard and Thompson (1974) and Berg (1975, 1976) for the same site and using the same data sets, the greatest discrepancy is 0.07 seconds (approximately 2 meters), and on average only 0.05 seconds. As these differences are within the scaling error on the best charts, which seldom are on a scale of better than 1:10,000, it is clear that the considerable extra expense involved in these other methods was not justified for the purposes of this study.

#### DATA ACQUISITION

Satellite Navigation positioning data were collected at 22 different ports in the Pacific from October 5, 1970 to July 14, 1974. Due to changes in moored position and return visits to the

same port there are a total of 34 positions where the research vessel was either moored or at anchor and data were taken. In all there are a total of 45 data sets ranging in size from four fixes for one of the occupations at Guayaquil, Ecuador to 377 at Honolulu, Hawaii.

#### SYSTEM DESCRIPTION

During the time of collection of the data contained in this paper there were a maximum of six operational Doppler satellites in the Navy Navigation Satellite System (NNSS). Each satellite of the NNSN is in a circular polar orbit approximately 600 nautical miles above the surface of the earth. Each satellite makes a complete circle of the earth in approximately 105 minutes thus providing intermittent position fix updates rather than continuous navigation information as is provided by such systems as Omega. During a satellite pass the user receives line-of-sight UHF signals from each satellite both day and night and in all weather conditions. For the most accurate and consistent results the maximum elevation angle of the satellite above the horizon should lie between 15 and 75 degrees (Newton, 1967).

The satellites of the NNSN transmit two stable frequencies (about 150 and 400 MHz). By scaling and comparing Doppler frequency shifts of both signals, the first order effects of ionospheric refraction may be measured and eliminated in the computer program.

The satellite's memory system contains the navigation message which is transmitted on the 400 MHz signal in phase modulation. This navigation message is transmitted continuously and is timed to last exactly two minutes, beginning and ending at the instant of each even minute. The message readout is precisely controlled so that the beginning and end of each two minute message serves as an accurate time mark. The navigation message is based on a predicted ephemeris which is updated every 12 hours with parameters suitable for the following 16 hours. The broadcast message consists of a fixed part which defines a smooth, precessing elliptical orbit and a variable part consisting of a set of corrections to the elliptical orbit defining the predicted position of the satellite at eight two-minute time points. This variable part of the navigation message is changed every two minutes with the deletion of the oldest time point and the addition of orbital corrections at a new time point.

The ground based receiver records the transmitted fixed frequency signal. Due to the motion of the satellite in its orbit the fixed frequencies transmitted by each satellite appear to change as a function of time, this is the Doppler effect. The Doppler shift is proportional to the time rate of change of the slant range to the satellite (range rate). Given an assumed initial position of the receiver and a calculated range rate for a time instant  $t_i$  the so called frequency effect can be determined. The calculated and measured quantities are compared and residuals formed, the assumed initial quantities are then varied until a best fit is achieved (Newton, 1967).

The Magnavox 702/CA (Mx/702/hp) Satellite Navigation System consists of the following basic elements:

- a 43 pound antenna-preamplifier unit
- 200 feet of coaxial cable
- a Doppler receiver
- a Hewlett-Packard 2114 computer
- an ASR-33 teleprinter for input-output.

The input/output system aboard the R/V Kana Keoki allows dialogue between the HP 2114 Satellite Navigation computer and the central Data Logging system using a Nova mini-computer. Thus positions fixes may be merged with other data in near real time to allow the scientific party to monitor the geophysical environment while underway. A non-trivial side benefit of this computer to computer connection is the ability to reload the navigation program in a matter of seconds from magnetic tape rather than the 45 minutes required to reload the program using punched paper tape.

#### REMARKS ON DATA UTILIZED

Only the information contained in the standard satellite fix output of the HP 2114 computer was used in this study. Two programs were used during the period over which the data were accumulated, the MAPS-70065 program aboard the R/V Mahi in 1970 and the MAPS-70356 program aboard the R/V Kana Keoki subsequently. The satellite navigation program output was changed by deleting those parameters

relating to the movement of the receiver. The parameters retained and used in the present analysis are as follows:

INPUT DATA

1. DATE: (DATE) The Julian Day Number representing the consecutive numbering of days of the year, i.e. DATE 59 is 28 February.
2. TIME: (GMT) The Greenwich Mean Time of the position fix in hours and minutes.
3. SATELLITE: (SAT) Six near-polar orbit navigation satellites were used to measure these data samples. A two digit numbering code for the satellites, related to the semi-major axis in kilometers, was adopted. The correspondence to the Satellite Number is listed below:

SATELLITE	SEMI-MAJOR AXIS	SATELLITE #
42	7442	30120
54	7455	30140
63	7463	30180
64	7464	30130
65	7465	30190
67	7399	30200

4. ELEVATION ANGLE: (ELEV) Vertical angle of the satellite above the horizon at closest approach to the observing station measured in degrees.

5. ANTENNA HEIGHT: Geoid height, as taken from the geoidal map in the Magnavox manual, added algebraically to the ship's antenna height above sea level.
6. ITERATIONS: (IT) Number of iterations required for the program to converge on a fix.
7. DOPPLER COUNTS: (CTS) Number of counts received and used in the computation of the individual fix.
8. DOPPLER COUNT SEQUENCE: (CTSQ) Number of balanced (symmetric) 24 second counts about the point of closest approach.

DERIVED QUANTITIES:

1. LATITUDE: (LATITUDE) Latitude of observed points measured from the equator to the station in degrees, minutes and seconds of arc.
2. LONGITUDE: (LONGITUDE) Longitude of observation points measured from the Greenwich Meridian to the station in degrees, minutes and seconds of arc.

In Table 1 the dates, description of sites and number of fixes utilized at each site are listed. Figure 1 shows the geographic distribution of the sites.

SOURCES OF ERROR IN THE MEASUREMENTS AND SELECTION CRITERIA USED:

Each individual satellite fix may be influenced by several factors: the elevation angle, the antenna height assumed, the number of Doppler counts and the symmetry of the Doppler count sequence. These latter two indicate the quantity and quality of the Doppler

TABLE 1  
DATES AND LOCATION OF SATELLITE FIXES

TABLE NUMBER	DATES	PORT AND LOCATION	NUMBER OF FIXES	# OF FIXES USED
1A-1	4-6 to 4-20-70	Honolulu, Hawaii Pier 18	87	66
1A-2	11-1 to 11-4-72 11-7 to 11-8-72	Honolulu, Hawaii Pier 18	68	44
1A-3	11-4 to 11-6-72	Honolulu, Hawaii Pier 18	37	29
1A-4	11-6 to 11-7-72	Honolulu, Hawaii Pier 10	8	5
1A-5	7-23 to 7-26-73	Honolulu, Hawaii Port side to Pier 18	36	30
1A-6	9-8 to 9-10-73	Honolulu, Hawaii Port side to Pier 18	45	31
1A-7	10-17 to 10-24-73	Honolulu, Hawaii Port side to Pier 18	139	102
1A-8	12-19 to 12-31-73 1-1 to 1-7-74	Honolulu, Hawaii Port side to Pier 18	377	252
1A-9	1-9-74	Honolulu, Hawaii Pier 40	17	11
2A-1	6-3 to 6-5-70	Pago Pago, Samoa, Oil Dock	25	21
3A-1	6-24-70	Suva, Fiji, King's Wharf	9	7
3A-2	6-25-70	Suva, Fiji, Dolphins	10	8
3A-3	6-26-70	Suva, Fiji, In Dry Dock	9	8
3A-4	7-20 to 7-21-71	Suva, Fiji, NW end of King's Wharf	19	10
3A-5	7-21 to 7-26-71	Suva, Fiji, Dolphins, NE of King's Wharf	77	56
3A-6	7-29 to 8-2-71	Suva, Fiji, Dolphins, NE of King's Wharf	117	81
3A-7	12-24 to 12-25-72	Suva, Fiji, 500 foot mark of King's Wharf	25	15

TABLE 1 (continued)

TABLE NUMBER	DATES	PORT AND LOCATION	NUMBER OF FIXES	# OF FIXES USED
3A-8	11-25 to 11-27-72	Suva, Fiji, Dolphins at Government Slipway	40	28
4A-1	8-4-70	Rabaul, New Britain, moored at dock	7	5
5A-1	9-18, 9-23-70	Guam, Dillingham Pier	7	13
5A-2	10-31 to 11-6-70	Guam, Dillingham Pier	21	6
6A-1	10-5 to 10-6-70	Majuro, Marshall Is., "T" Wharf	6	4
7A-1	5-26 to 5-29-71	Ponape, Caroline Is., Main Dock	40	24
8A-1	6-16 to 6-19-71	Palau, Caroline Is., Main Dock at Malakal Is.	56	37
9A-1	8-29 to 9-1-71	Wellington, New Zealand, Moored to East side of "Glasgow" Wharf	58	43
10A-1	1-15 to 1-22-72	Callao, Peru, Berth 9-D, (Callao A)	106	70
10A-2	2-23 to 2-27-72	Callao, Peru, Berth 4-A, (Callao B)	84	54
11A-1	2-29-72	Ancon, Peru, swinging at anchor, not dragging	11	8
12A-1	3-14 to 3-15-72	Talara, Peru, Swinging at anchor, not dragging	25	11
13A-1	4-13 to 4-20-72	Guayaquil, Ecuador, Berth #2, Puerto Maritimo	111	73
13A-2	2-15 to 2-19-73	Guayaquil, Ecuador, Port side to Berth #2	63	45
13A-3	2-19 to 2-20-73	Guayaquil, Ecuador, Port side to Caribbean Tiuna	22	12

TABLE 1 (continued)

TABLE NUMBER	DATES	PORT AND LOCATION	NUMBER OF FIXES	# OF FIXES USED
13A-4	3-6-73	Guayaquil, Ecuador, Port side to Berth #6	4	3
14A-1	5-1 to 5-2-72	Puntarenas, Costa Rica, at anchor	19	11
15A-1	5-11 to 5-12-72	Acapulco, Mexico, Moored at dock	20	12
15A-2	5-12 to 5-18-72	Acapulco, Mexico, 6 meters West of above position	47	26
15A-3	7-14-74	Acapulco, Mexico, Moored to Pier	6	5
16A-1	7-21-72	Sand Island, Midway, main pier	18	13
17A-1	1-21-73	Papeete, Tahiti, Port side to North end of main wharf	7	7
17A-2	5-31 to 6-1-73	Papeete, Tahiti, Fuel Dock	15	11
18A-1	4-3-73	Antofagasta, Chile, Port side to Sitio #2	52	36
19A-1	4-29 to 4-30-73	Easter Is., swinging at anchor in Cook Bay	14	12
20A-1	5-23-73	Pitcairn Is., swinging at anchor in Bounty Bay	6	6
21A-1	5-22 to 5-26-74	Valparaiso, Chile, Berth #4	38	25
22A-1	6-16 to 6-21-74	Balboa, Panama, Rodman Naval Base, Pier #2	82	55

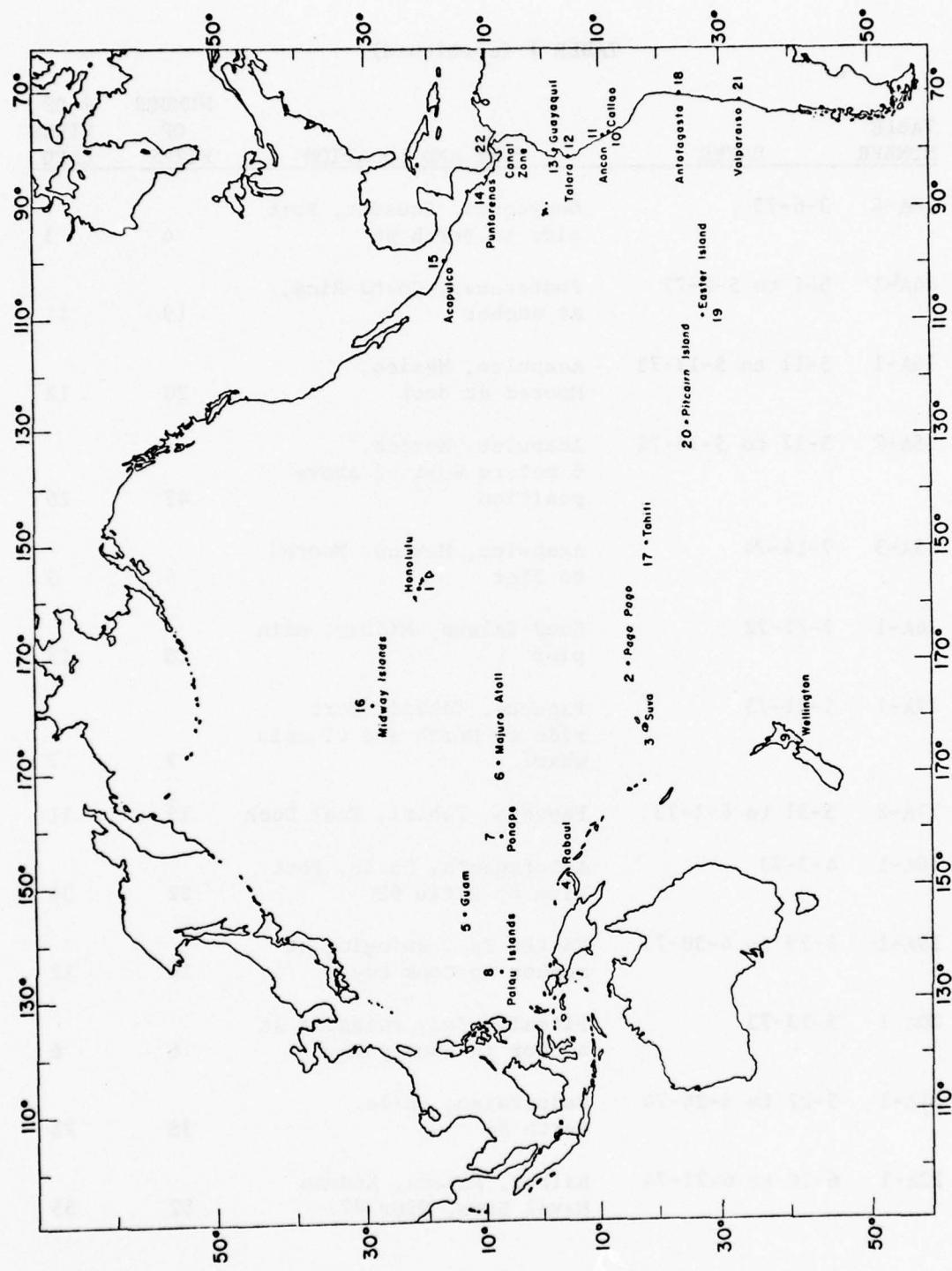


Figure 1. Chart of the Pacific showing harbor sites.

data received. The quantity of information is indicated by the number of Doppler counts while the quality of the information is shown by the number of balanced (symmetric) Doppler counts about the point of closest approach.

Newton (1967) indicated that the elevation angle affects the positional accuracy of satellite fixes in several ways. A significant cross-track effect may be created by the increasing effects of refraction which can be quite serious for low elevation passes. The high elevation passes, which do not suffer from data loss, have increasing sensitivity to errors in the cross-track direction since the elevation angle usually enters these error factors as the tangent of the angle, thus approaching infinity at an elevation angle of 90°. For this reason Newton advocates deleting all passes below 15° and above 75° elevation angles. Similarly Stansell (1970) has pointed out the importance of the antenna height used and the effect on the tangent of the satellite elevation angle and tropospheric effect particularly in defining longitude positions for East and West passing satellites. Berg (1975, 1976), even after applying these corrections found that certain data sets were of such variance from the rest, that the values should be rejected in deriving a final solution.

For the purposes of defining the arithmetic mean position of each site in the writer's investigation the following editing or rejection criteria were adopted. First, data for elevation angles less than 15° and greater than 75° were not used in the computations for reasons stated above.

A second rejection criterion was that there be no more than five program iterations (IT) required for convergence on a solution. This was chosen as a quick means of eliminating data lacking in quality or quantity or both from computation of the mean. As will be seen from an inspection of the tables in Appendix B the number of iterations is closely correlated with the information content and distribution.

The final automatic rejection criterion was based on first making a trial arithmetic solution and then inspecting all data for deviation against the trial mean. All passes having deviations of greater than 10 seconds of arc in either latitude or longitude were flagged and not included in the final computation of the arithmetic mean. Again inspection of the tables will show that passes with large deviations are generally those with low or high elevation angles, a low number of Doppler counts or a poor count sequence, or a combination of these. Although it can be argued that this is not a valid procedure since it represents in some cases an "overkill" and in other cases the incorporation of data that would have been rejected on the basis of probability theory, it does put all the data on a uniform numerical standard defined statistically for acceptance or rejection.

## SATELLITE RESULTS OBTAINED

Even though excluded from the computation of the mean and the statistics of the position fix, the data eliminated in the described editing procedures are included in the tables but are flagged appropriately for easy identification. In Appendix B, tables 1A-1 to 22A-1, are listed the satellite fix information for the data used in this paper. In the following section the various statistical techniques used to test the data samples for reliability are discussed. Also in Appendix B are tables 1B-1 to 22B-1 which show the satellite determined mean latitude and longitude as well as the standard deviation and the standard deviation of the mean, and tables 1C-1 to 22C-1 showing similar information but with the data sorted to give a solution for each satellite by satellite number.

## STATISTICAL TESTS OF RELIABILITY ADOPTED

The initial statistic that was calculated on all samples was the most obvious one, the arithmetic mean. This is shown in Appendix B, tables 1B-1 to 22B-1, where NP is the number of fixes, N is the number of fixes eliminated from the sample and NSD is the number of fixes used to calculate the mean. The statistical parameters used as a measure of precision of the positional data were the standard deviation of a single observation

$$s_x = \pm \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}}$$

and the standard deviation of the mean

$$s_{\bar{x}} = \pm \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n(n-1)}}$$

where  $n$  in the number of observations and  $\bar{x}$  is the mean.

Tables 1B-1 to 22B-1 also give the derived average latitude and longitude values and the standard deviation and the standard deviation of the mean in seconds of arc for each station. Tables 1C-1 to 22C-1 presents similar information with the data sorted to give a solution for each satellite by satellite number. As seen from an inspection of the above tables, recognized earlier by Berg (1975, 1976), all satellites are not of equal reliability at any given time. Satellite 54, for example, gave significantly different results from the other satellites much of the time.

#### DISCUSSION OF SATELLITE RESULTS

Table 2 is a summary of the data given in Tables 1B through 22B-1 in the appendix and site and the number of observations accepted in each case after editing for computation of the arithmetic mean values of latitude and longitude. Also shown in this table is the spread in maximum and minimum values of latitude and longitude recorded for each series of measurements, and where the ship was at the same site more than once, the weighted mean average of the mean latitude and longitude values are given for the site as well as the

arithmetic average. As seen, it is only at Honolulu that there is any significant difference (approximately 0.3 seconds of arc) between the weighted mean average values and a straight average of average values for each series of observations. That this weighting of values on the basis of the number of observations in each series may be less preferable than straight averaging of series values is evident from the following tabulation showing how the standard deviation varies with number of observations in a series. The data are for Pier 18 Honolulu.

N	Latitude Std. Dev.	Longitude Std. Dev.
27	1.3	1.4
29	1.3	1.3
31	1.2	1.4
44	1.4	1.9
101	1.5	1.9
252	<u>1.4</u>	<u>1.2</u>
Avg.	1.35	1.51

As seen from the above there is no apparent systematic relationship between the standard deviation values and the number of observations indicating that some factor having greater weight than size of sample is involved in determining the reliability of a fix. That the above is a general situation is brought out in Table 3 showing the spread between minimum and maximum deviations from the mean for latitude and longitude along with the average

TABLE 2  
MAXIMUM AND MINIMUM VALUES FOR LATITUDE AND LONGITUDE

PORT AND LOCATION	# Obs	# Obs Used	o	Minimum "	Maximum "	Arithmetic			Maximum "	Maximum "	Arithmetic Mean "	
						Mean "	Mean o	Mean "				
Honolulu, Pier 18	86	66	21	18 44.22	19 00.84	18 48.21	157 45	39.66	52 05.34	52 01.53		
	68	44	42	30 55.22	18 55.22	48.42	51	59.76	04.26	01.30		
	37	29	32	28 53.10	49.92	55.14	07.14		00.90			
	36	30	46	28 53.16	48.34	58.56	07.20		01.48			
	45	31	33	24 19 09.12	48.70	52.26		11.94	01.70			
	139	102	24	72 33 06.96	48.17	48 04.32	53	31.38	01.56			
	377	252	17	54.60 23 38.16	48.19	51 42.18	55	22.92	01.48			
Average:		18 30.81	21	10.08	18 48.56	50 27.41	52	47.17	52 01.56			
Weighted Mean:												
Honolulu, Pier 10	8	5	21	18 13.98	18 28.26	18 27.82	157 51	54.36	52 02.82	51 58.99		
Honolulu, Pier 40	17	11	21	18 56.58	19 06.60	19 04.31	157 52	37.20	53 34.02	52 54.09		
Pago Pago, Oil Dock	25	21	14	16 32.10	16 44.34	16 34.91	170 40	51.78	40 58.38	40 55.32		
Suva, King's Wharf	9	7	18 07 41.76	07 48.48	07 47.36	178 25	30.90	25 35.94	25 34.10			
Suva, Dolphins	10	8	18 07 46.20*	07 51.42*	07 49.00*	178 25	35.10*	25 42.36*	25 37.55*			
	77	56	44.46	54.72	46.79	24.96		36.18	32.27			
*Values with wrong antenna height. Not used in averages.	114	81	40.62	08 13.68	46.76	24 01.14	45.30	32.20	25 32.24	25 32.23		
Average:		07 42.59	08 04.25	07 46.77	24 42.55	25 40.74						
Weighted Mean:				07 46.76								
Suva, Dry Dock	9	8	18 07 45.98	07 54.90	07 49.60	178 25	34.08	25 40.92	25 37.40			
Suva, NW of King's Wharf	19	10	18 07 41.22	08 06.36	07 56.27	178 25	12.66	25 36.42	25 26.68			
Suva, 500' mark	25	15	18 07 54.60	08 01.62	07 59.91	178 25	00.90	25 48.06	25 25.28			
Suva, Gov't Slipway	40	28	18 07 25.38	07 51.06	07 46.65	178 25	26.64	26 12.00	25 32.45			

TABLE 2 (continued)

PORT AND LOCATION	# Obs	# Obs Used	o	Minimum "	Maximum "	Arithmetic		Arithmetic								
						Mean	"	o	Minimum "							
Rabaul, Main Dock	7	5	4	11	58.14	12	03.24	12	01.43	152	10	14.52	10	20.16	10	17.98
Guam, Dillingham Pier	21	13	13	27	19.62	27	56.10	27	42.63	144	39	08.76	39	59.52	39	52.61
	7	6	27	39.96	27	44.46	42.20	51.78	55.62	53.16	53.22					
Average:			27	29.79	27	50.28	27	42.42	39	30.27	39	57.57	39	52.92		
Weighted Mean:						27	42.49								39	52.80
Majuro, "T" Wharf	6	4	7	06	13.02	06	25.20	06	18.99	171	22	09.18	22	23.16	22	16.59
Ponape, Main Dock	39	24	6	58	40.02	59	15.18	58	44.74	158	11	54.66	13	19.14	12	01.97
Palau, Main Dock	55	37	7	19	34.20	20	12.96	19	49.34	134	27	05.94	27	51.78	27	23.49
Wellington, Glasgow Wharf	58	43	41	16	35.10	18	03.60	16	54.19	174	45	37.44	47	23.34	46	57.55
Callao, Berth 9-D	104	70	12	02	55.86	03	33.18	03	19.62	77	07	00.30	09	30.72	08	58.97
Callao, Berth 4-A	84	54	12	01	40.80	08	05.88	02	50.43	77	08	12.24	15	22.68	08	44.97
Ancon, Anchored	11	8	11	44	25.62	45	14.76	44	31.51	77	10	17.40	19	35.46	10	24.73
Talara, Anchored	25	11	04	33	30.96	34	03.78	33	44.51	81	17	14.76	17	34.26	17	20.44
Guayaquil, Berth #2	110	73	2	16	43.98	20	12.18	16	59.84	79	51	43.02	54	38.10	54	20.35
	64	45	16	47.28	25.32	59.76	53.16	58.11*	54	09.48*	38.10	38.10			20.46	
*Omitted in averages.	22	12		37.50*	17	17.76*			52	48.09	33.18*	33.18*			23.65*	
Weighted Mean																
Guayaquil, Berth #6	4	3	2	16	43.62	16	46.38	16	43.86	79	54	43.44	54	46.50	54	44.60
Puntarenas, Anchored	19	11	9	57	47.40	57	54.90	57	51.33	84	49	19.32	49	29.28	49	26.30

TABLE 2 (continued)

PORT AND LOCATION	# Obs	# Obs Used	Minimum	Maximum	Arithmetic		Arithmetic	
					Mean	"	Mean	"
Acapulco, Main Dock	20	12	16 50 41.76	51 05.76	50 53.76	99 54 04.74	54 39.84	54 15.86
	6	5	30.78	50 54.66	53.84	51 11.88	20.22	17.23
	Average:	50	36.27	51 00.21	50 53.80	52 38.31	54 30.03	54 16.55
	Weighted Mean:			50 53.78				54 16.47
Acapulco, W of Main Dock	47	26	16 50 44.28	51 15.48	50 54.65	99 53 19.38	59 11.76	54 19.16
Midway, Main Pier	18	13	28 12 47.52	13 01.98	12 50.37	177 21 43.08	21 53.76	21 48.40
Papeete, Main Wharf	7	7	17 31 59.58	32 03.90	32 01.50	149 34 20.70	34 22.74	34 21.80
Papeete, Fuel Dock	15	11	17 31 57.30	32 20.16	32 14.22	149 34 09.06	35 30.66	34 10.69
Antofagasta, Sitio #2	52	36	23 39 09.96	39 42.12	39 13.70	70 24 00.78	24 35.64	24 20.40
Easter Is., Anchored	14	12	27 08 20.70	08 33.18	08 30.42	109 26 16.26	26 28.86	26 18.43
Pitcairn Is., Anchored	6	6	25 03 51.24	03 53.88	03 52.02	130 05 33.72	05 38.58	05 36.17
Valparaiso, Berth #4	38	25	33 01 45.12	02 07.32	02 00.48	71 37 30.24	38 37.68	37 36.72
Balboa, Pier #2	81	55	8 52 04.80	57 17.10	57 06.86	79 30 22.02	35 06.90	34 22.90

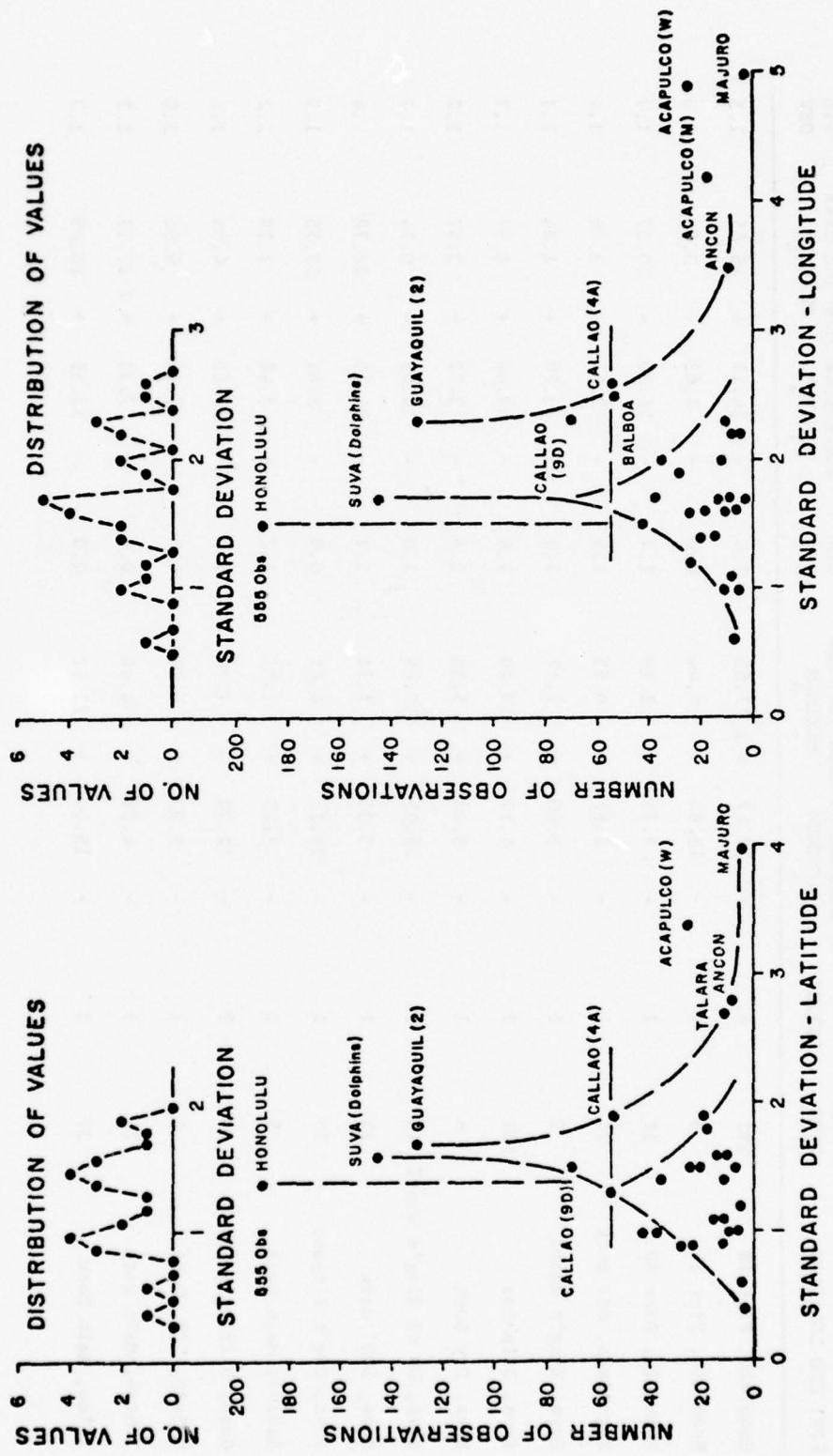


Figure 2

TABLE 3  
DIFFERENCE FROM THE MEAN IN LATITUDE AND LONGITUDE

PORT AND LOCATION	# OBS USED	SERIES	DIFFERENCE FROM THE MEAN			STD DEV	DIFFERENCE FROM THE MEAN			STD DEV
			MINIMUM	MAXIMUM	" "		MINIMUM	MAXIMUM	" "	
Honolulu, Pier 18	555	6	- 17.47	+ 21.80	1.4	- 1 34.11	+	45.65	1.5	
Honolulu, Pier 10	5	1	- 13.84	+ 0.44	0.6	- 4.63	+	3.83	1.0	
Honolulu, Pier 40	11	1	- 7.73	+ 2.29	1.4	- 16.89	+	20.07	1.7	
Pago Pago, Oil Dock	21	1	- 2.81	+ 9.43	1.5	- 3.54	+	3.06	1.4	
Suva, King's Wharf	7	1	- 5.60	+ 1.12	1.0	- 3.20	+	1.84	1.1	
Suva, Dolphins	137	2	- 4.17	+ 17.49	1.6	- 49.68	+	8.51	1.7	
Suva, Dry Dock	8	1	- 3.62	+ 5.30	2.8	- 3.32	+	3.52	2.2	
Suva, NW of King's Wharf	10	1	- 15.05	+ 10.09	1.0	- 14.02	+	9.74	1.7	
Suva, 500' mark	15	1	- 5.31	+ 1.71	1.1	- 24.38	+	22.78	1.4	
Suva, Gov't Slipway	28	1	- 21.27	+ 4.41	0.9	- 5.81	+	39.55	1.9	
Rabaul, Main Dock	5	1	- 3.29	+ 1.81	1.2	- 3.46	+	2.18	2.2	
Guam, Dillingham Pier	19	2	- 12.70	+ 7.79	1.9	- 22.65	+	4.65	1.6	
Majuro, "T" Wharf	4	1	- 5.97	+ 6.21	4.0	- 7.33	+	6.65	5.0	
Ponape, Main Dock	24	1	- 4.72	+ 30.44	0.9	- 7.31	+	17.17	1.2	
Palau, Main Dock	37	1	- 15.14	+ 23.62	1.0	- 17.55	+	28.29	1.7	

TABLE 3 (continued)

PORT AND LOCATION	# OBS USED	SERIES	DIFFERENCE FROM THE MEAN		STD DEV	DIFFERENCE FROM THE MEAN		STD DEV
			MINIMUM "	MAXIMUM "		MINIMUM "	MAXIMUM "	
Wellington, Glasgow Wharf	43	1	- 19.09	+ 1 09.41	1.0	- 1 20.11	+ 25.79	1.5
Callao, Berth 9-D	70	1	- 23.76	+ 13.56	1.5	- 1 58.67	+ 31.75	2.3
Callao, Berth 4-A	54	1	- 1 09.63	+ 5 15.45	1.9	- 32.73	+ 37.71	2.5
Ancon, Anchored	8	1	- 5.89	+ 43.25	2.8	- 7.33	+ 9 10.73	3.5
Talara, Anchored	11	1	- 13.55	+ 19.27	2.7	- 5.68	+ 13.82	2.3
Guayaquil, Berth #2	130	2	- 16.32	+ 2 19.18	1.7	- 1 46.27	+ 14.97	2.3
Guayaquil, Berth #6	3	1	- 0.24	+ 2.52	0.4	- 1.16	+ 1.90	1.7
Puntarenas, Anchored	11	1	- 3.93	+ 3.57	1.1	- 6.98	+ 2.98	1.6
Acapulco, Main Dock	17	2	- 17.53	+ 6.41	1.8	- 1 38.24	+ 13.48	4.2
Acapulco, W of Main Dock	26	1	- 10.37	+ 20.83	3.4	- 59.78	+ 4 52.60	4.9
Midway, Main Pier	13	1	- 2.85	+ 11.61	1.6	- 5.32	+ 5.36	2.0
Papeete, Main Wharf	7	1	- 1.92	+ 2.40	1.5	- 1.10	+ 0.94	0.6
Papeete, Fuel Dock	11	1	- 16.92	+ 5.94	0.9	- 1.63	+ 1 29.97	1.0
Antofagasta, Sito #2	36	1	- 3.74	+ 28.42	1.4	- 19.62	+ 15.24	2.0
Easter Is., Anchored	12	1	- 9.72	+ 2.76	1.6	- 2.17	+ 10.43	1.7

TABLE 3 (continued)

PORT AND LOCATION	# OBS USED	SERIES	DIFFERENCE FROM THE MEAN		STD DEV	DIFFERENCE FROM THE MEAN		STD DEV
			MINIMUM	MAXIMUM		MINIMUM	MAXIMUM	
Pitcairn Is., Anchored	6	1	- 0.78	+ 1.86	1.0	- 2.45	+ 2.41	1.6
Valparaiso, Berth #4	25	1	- 15.36	+ 6.84	1.5	- 6.48	+ 1 00.96	1.6
Balboa, Pier #2	55	1	- 4 49.76	+ 10.24	1.3	- 4 00.88	+ 44.00	1.6

standard deviation values for each site. A possible statistical explanation is brought out in Figure 2. In the figure the distribution of standard deviation values is plotted to see if they have a normal distribution, and a plot presented to show on an overall basis they are related to the number of observations.

As seen from Figure 2, (1) the standard deviation value defines a bimodal rather than a Gaussian (normal) distribution; (2) they are only partially related to the number of observations taken, and (3) certain sites are consistently subject to significant probable error in both latitude and longitude. This last is indicated by the values for these sites lying outside the envelope defining a convergence in values towards the most probable standard deviation to be expected. It is also to be noted that the standard deviation values are not significantly improved by taking more than 55 observations at a given site, and because of the bimodal distribution in values found, one should not expect better, on the average, than a standard deviation of 1.3 seconds of arc for latitude and 1.7 seconds of arc for longitude. The values which fall outside the envelope enclosing most of the data points at first glance appear to be a function of geographic location, and for the most part are restricted to the West Coast of Central and South America. However, this is not consistently true, and it can only be concluded that the large standard deviations noted for these observations as well as the bimodal distribution pattern shown are functions of the satellites involved. The most probable explanation

appears to be that there are errors in the ephemeris values, since the data considered were edited to eliminate all values apt to be suspect because of elevation angle values, or number of iterations needed, as well as those values whose standard deviation values departed significantly ( $>10$  seconds of arc) from the mean.

#### RESULTS ON CHARTED POSITIONS VERSUS SATELLITE DEFINED POSITIONS

All of the charts used for defining position were the most recent available, and except for the one for Ancon, Peru issued in 1923 and the one for Rabaul issued in 1966, all of the charts represent post 1972 editions. As seen from Table 4, the scales for these charts varies from 1:5,000 to 1:36,481, and for the most part they have a scale of 1:10,000 and 1:12,500 (11 charts) or 1:25,000 and 1:35,000 (8 charts). If an average reliability of 1 mm is assumed for the ship's plotted positions at a dock or anchorage, on a chart of 1:10,000 scale there would be an uncertainty of about 10 meters or 0.3 seconds in position. For charts on a scale of 1:25,000 and 1:35,000, the uncertainty is proportionally greater. The uncertainty in scaling coordinates for these charted positions, on the other hand, is based on the spread in values obtained for the positions which were scaled twice by two different observers. This was of the order of  $\pm 0.2$  mm.

Table 5 lists the chart-measured coordinates and the satellite-derived coordinates. Table 6 lists the comparison of the chart-and

TABLE 4  
CHARTS USED FOR POSITION COMPARISONS WITH SATELLITE DATA

LOCATION	CHART #	YEAR	SCALE	AUTHORITY
Acapulco	21401	1974	1:25,000	Defense Mapping Agency, Hydrographic Center
Ancon	22171	1923	1:36,481	United States Navy, Hydrographic Office
Antofagasta	22221	1976	1:12,500	DMA-HC
Callao	22172	1972	1:10,000	DMA-HC
Easter Is	22451	1975	1:23,173	USN-HO
Guam	81048	1975	1:10,000	National Oceanic and Atmospheric Administration
Guayaquil	22113	1973	1:10,000	DMA-HC
Honolulu	19367	1974	1:5,000	NOAA
Majuro	81782	1974	1:35,000	DMA-HC
Midway	19481	1973	1:32,500	NOAA
Pago Pago	83484	1975	1:15,000	NOAA
Palau	81155	1972	1:10,000	DMA-HC
Papeete	83385	1975	1:6,000	DMA-HC
Panama	21604	1976	1:12,500	DMA-HC
Pitcairn Is	83225	1972	1:24,079	DMA-HC
Ponape	81435	1975	1:36,115	DMA-HC
Puntarenas	21546	1976	1:12,500	DMA-HC
Rabaul	82192	1966	1:25,000	USN-HO

TABLE 4 (continued)

LOCATION	CHART #	YEAR	SCALE	AUTHORITY
Suva	83605	1975	1:12,150	Defense Mapping Agency, Hydrographic Center
Talara	22121	1976	1:10,000	DMA-HC
Valparaiso	22259	1976	1:8,000	DMA-HC
Wellington	76071	1975	1:12,000	DMA-HC

TABLE 5  
CHART EVALUATIONS AND SATELLITE COORDINATES

TABLE NUMBER	LOCATION	CHART EVALUATION OF DOCKING SITE	SATELLITE COORDINATES	DIFFERENCE
1A-1	Honolulu, Pier 18	21° 19' 00" 157° 52' 10.6"	21° 18' 48.2" N 157° 52' 01.53" W	+ 11.8 + 9.1
1A-2	Honolulu, Pier 18	21° 19' 00" 157° 52' 10.6"	21° 18' 48.41" N 157° 52' 01.30" W	+ 11.6 + 9.3
1A-3	Honolulu, Pier 18	21° 19' 00" 157° 52' 10.5"	21° 18' 49.92" N 157° 52' 00.90" W	+ 11.1 + 9.6
1A-4	Honolulu, Pier 10	21° 18' 38.5" 157° 52' 08.8"	21° 18' 27.81" N 157° 51' 58.99" W	+ 10.7 + 9.8
1A-5	Honolulu, Pier 18	21° 19' 00" 157° 52' 10.6"	21° 18' 48.34" N 157° 52' 01.48" W	+ 11.7 + 9.1
1A-6	Honolulu, Pier 18	21° 19' 00" 157° 52' 10.6"	21° 18' 48.70" N 157° 52' 01.70" W	+ 11.3 + 8.9
1A-7	Honolulu, Pier 18	21° 19' 00" 157° 52' 10.6"	21° 18' 48.48" N 157° 52' 01.14" W	+ 11.5 + 9.5
1A-8	Honolulu, Pier 18	21° 19' 00" 157° 52' 10.6"	21° 18' 48.19" N 157° 52' 01.47" W	+ 11.8 + 9.1
1A-9	Honolulu, Pier 40	21° 19' 14.3" 157° 53' 03.3"	21° 19' 04.31" N 157° 52' 54.09" W	+ 10.0 + 9.2
2A-1	Pago Pago, Oil Dock	14° 16' 45.0" 170° 41' 09.5"	14° 16' 34.91" S 170° 40' 55.32" W	+ 10.1 + 14.2

TABLE 5 (continued)

TABLE NUMBER	LOCATION	CHART EVALUATION OF DOCKING SITE		SATELLITE COORDINATES	DIFFERENCE
		CHART	EVALUATION		
3A-1	Suva, King's Wharf	18° 08' 00.5"	18° 07' 47.36" S	18° 07' 47.36" S	+ 13.1
		178° 25' 42.5"	178° 25' 34.10" E		+ 8.4
3A-2	Suva, Dolphins	18° 07' 53.5"	18° 07' 49.00" S	18° 07' 49.00" S	+ 4.5
		178° 25' 45.0"	178° 25' 37.55" E		+ 7.5
3A-3	Suva, Dry Dock	18° 07' 55.8"	18° 07' 49.60" S	18° 07' 49.60" S	+ 6.2
		178° 25' 47.0"	178° 25' 37.40" E		+ 9.6
3A-4	Suva, NW of King's Wharf	18° 08' 00"	18° 07' 56.27" S	18° 07' 56.27" S	+ 4.2
		178° 25' 39.5"	178° 25' 26.68" E		+ 12.8
3A-5	Suva, Dolphins	18° 07' 53.5"	18° 07' 46.79" S	18° 07' 46.79" S	+ 7.6
		178° 25' 45.0"	178° 25' 32.27" E		+ 12.7
3A-6	Suva, Dolphins	18° 07' 53.5"	18° 07' 46.74" S	18° 07' 46.74" S	+ 6.8
		178° 25' 45.0"	178° 25' 32.20" E		+ 12.8
3A-7	Suva, 500' King's Wharf	18° 08' 05.0"	18° 07' 59.91" S	18° 07' 59.91" S	+ 5.1
		178° 25' 38.5"	178° 25' 25.28" E		+ 13.2
3A-8	Suva, Gov't Slipway	18° 07' 52.5"	18° 07' 46.65" S	18° 07' 46.65" S	+ 5.6
		178° 25' 46.4"	178° 25' 32.45" E		+ 13.9
4A-1	Rabaul, Main Dock	4° 12' 10.0"	4° 12' 01.43" S	4° 12' 01.43" S	+ 8.6
		152° 10' 08.0"	152° 10' 17.98" E		- 10.0
5A-1	Guam, Dillingham Pier	13° 27' 35.3"	13° 27' 42.20" N	13° 27' 42.20" N	- 6.7
		144° 39' 43.0"	144° 39' 53.22" E		- 10.2
5A-2	Guam, Dillingham Pier	13° 27' 35.5"	13° 27' 42.63" N	13° 27' 42.63" N	- 7.1
		144° 39' 43.0"	144° 39' 52.61" E		- 9.6

TABLE 5 (continued)

TABLE NUMBER	LOCATION	CHART EVALUATION OF DOCKING SITE		SATELLITE COORDINATES	DIFFERENCE
		CHART	EVALUATION		
6A-1	Majuro, "T" Wharf	7° 06' 24.0"	7° 06' 18.99" N	171° 22' 16.59" E	+ 5.0 + 1.4
7A-1	Ponape, Main Dock	6° 59' 12.0"	6° 58' 44.74" N	158° 12' 01.97" E	+ 27.3 + 57.0
8A-1	Palau, Main Dock	7° 19' 39.0"	7° 19' 49.34" N	134° 27' 23.49" E	+ 10.3 + 26.5
9A-1	Wellington, Glasgow Dock	41° 17' 00.0"	41° 16' 54.19" S	174° 46' 57.54" E	+ 5.8 + 0.5
10A-1	Callao, 9-D	12° 03' 29.0"	12° 03' 19.62" S	77° 08' 58.97" W	+ 9.4 + 45.5
10A-2	Callao, 4-A	12° 03' 24.0"	12° 02' 50.43" S	77° 08' 44.97" W	+ 33.6 + 53.0
11A-1	Arcon, Anchored	11° 44' 30.0"	11° 44' 31.51" S	77° 10' 24.73" W	- 1.5 + 5.3
12A-1	Talara, Anchored	4° 34' 00.0"	4° 33' 44.51" S	81° 17' 20.44" W	- 15.5 - 39.6
13A-1	Guayaquil, #2	2° 16' 47.0"	2° 16' 59.84" S	79° 54' 20.35" W	- 12.8 - 6.9
13A-2	Guayaquil, #2	2° 16' 47.0"	2° 16' 59.76" S	79° 54' 20.46" W	- 12.8 - 7.0
13A-3	Guayaquil, #2	2° 16' 47.0"	2° 16' 58.11" S	79° 54' 23.65" W	- 11.1 - 10.2
13A-4	Guayaquil, #6	2° 16' 33.5"	2° 16' 43.86" S	79° 54' 44.60" W	- 10.4 - 11.1

TABLE 5 (continued)

TABLE NUMBER	LOCATION	CHART EVALUATION OF DOCKING SITE	SATELLITE COORDINATES		DIFFERENCE
			9° 57' 54.0"	9° 57' 51.33"	
14A-1	Puntarenas, Anchored	9° 57' 54.0" 84° 49' 28.5"	84° 49' 26.39"	84° 49' 26.39"	+ 2.1
15A-1	Acapulco, Main Dock	16° 50' 47.0" 99° 54' 10.0"	16° 50' 53.76" N 99° 54' 15.86" N	16° 50' 54.65" N 99° 54' 19.16" W	- 6.8 - 5.9
15A-2	Acapulco, Main Dock	16° 50' 47.0" 99° 54' 12.0"	16° 50' 54.65" N 99° 54' 19.16" W	16° 50' 53.84" N 99° 54' 17.23" W	- 7.7 - 7.2
15A-3	Acapulco, W of Main Dock	16° 50' 47.0" 99° 54' 10.0"	16° 50' 54.65" N 99° 54' 17.23" W	16° 50' 53.84" N 99° 54' 17.23" W	- 6.8 - 7.2
16A-1	Midway, Main Pier	28° 12' 36.0" 177° 21' 46.0"	28° 12' 50.37" N 177° 21' 48.40" W	28° 12' 50.37" N 177° 21' 48.40" W	- 14.4 - 2.4
17A-1	Papeete, Main Wharf	17° 32' 19.5" 149° 34' 08.5"	17° 32' 01.50" S 49° 34' 21.80" W	17° 32' 01.50" S 49° 34' 21.80" W	+ 18.0 - 13.3
17A-2	Papeete, Fuel Dock	17° 32' 17.8" 149° 34' 08.3"	17° 32' 14.22" S 149° 34' 10.68" W	17° 32' 14.22" S 149° 34' 10.68" W	+ 3.6 - 2.4
18A-1	Antofagasta, Sitio #2	23° 39' 11.0" 70° 25' 19.0"	23° 39' 13.70" S 70° 24' 20.40" W	23° 39' 13.70" S 70° 24' 20.40" W	- 2.7 + 58.6
19A-1	Easter Island, Anchored	27° 08' 00.0" 109° 26' 30.0"	27° 08' 30.42" S 109° 26' 18.43" W	27° 08' 30.42" S 109° 26' 18.43" W	- 30.4 + 11.6
20A-1	Pitcairn Island, Anchored	25° 03' 41.0" 130° 05' 35.0"	25° 03' 52.02" S 130° 05' 36.17" W	25° 03' 52.02" S 130° 05' 36.17" W	- 11.0 - 1.2
21A-1	Valparaíso, Berth #4	33° 01' 55.0" 71° 37' 54.0"	33° 02' 00.48" S 71° 37' 36.72" W	33° 02' 00.48" S 71° 37' 36.72" W	- 5.5 + 17.3
22A-1	Balboa, Berth #2	8° 57' 12.0" 79° 34' 32.5"	8° 57' 06.86" N 79° 34' 22.90" W	8° 57' 06.86" N 79° 34' 22.90" W	+ 5.1 + 9.6

satellite defined positions. It will be noted that seven series of observations were taken over a four-year period for Pier 18 in Honolulu Harbor and that the latitude error indicated is  $+11.54 \pm .21$  seconds and for longitude  $+9.23 \pm .20$  seconds.

As Berg (1976) has reported what he regards as a "best" solution position for Pier 18 in Honolulu Harbor, it is of interest to compare this writer's coordinates for Pier 18 with those obtained by Berg using the double pass method and the additional rejection criteria he adopted in arriving at his "best" solution. In regard to this solution, Berg (1976), after using normal rejection criteria as to satellite elevation angles, iterations required, symmetry in Doppler counts and number of Doppler counts greater than 5, used the computed geoidal height from trial solutions as an additional criterion for rejection. Starting with what would normally be regarded as acceptable data for a double pass solution, Berg determined the geoidal height for each pair of consecutive passes of the same satellite. These pairs of values whose standard deviation in geoidal height exceeded  $2\sigma$  from the mean were then rejected for determining position location. In his solution for the position of Pier 18, Honolulu his first trial solution using the double pass method gave the following coordinates: Lat  $21^\circ 18.4042'$ ; Long  $157^\circ 52.0146'$ , antenna height 34.35 m. The second solution after rejecting one series of data whose antenna (geoidal) height exceeded the  $2\sigma$  limit, gave the following results: Lat  $21^\circ 18.8054'$ ; Long  $157^\circ 52.0166'$ ,

antenna height 32.26 m. The third solution after rejecting another series of observations whose antenna height exceeded the  $2\sigma$  limit for this set of data gave the following results: Lat  $21^\circ 18.8062'$ ; Long  $157^\circ 52.0151'$ ; antenna height 31.09 m. This sample of data was the one used to get a final 'best' position by repeating the process outlined above but with respect to the standard deviation for position coordinates not exceeding the  $2\sigma$  rejection criterion. In this process four more series of double passes were eliminated.

The final position determined by Berg (1976) for Pier 18, his "best" solution, gives the following coordinates: Lat  $21^\circ 18.8140$  ( $18' 48.48''$ ); Long  $157^\circ 52.0230'$  ( $52' 01.38''$ ). The position derived by the writer is Lat  $21^\circ 18' 48.56''$  (average) or  $21^\circ 18' 48.28''$  (weighted mean) and Long  $157^\circ 52' 01.56''$  (average) or  $157^\circ 52' 01.52''$  (weighted mean). As seen the difference in latitude is between  $0.08''$  and  $0.20''$  (2.5 to 7.5 meters), and the difference in longitude is between  $0.15''$  and  $0.18''$  (4.3 to 4.5 meters). Although this degree of agreement is undoubtedly fortuitous, it does support the initial assumption made in this study, namely that the method of analysis adopted is adequate for evaluating the reliability of published chart positions.

From an inspection of Table 6 and Figures 3 and 4 which are graphical representations of the difference in chart position and satellite defined positions, it is seen that the apparent degree in error in chart position varies significantly and that there are errors in excess of 50 seconds in latitude and longitude for several

TABLE 6  
DIFFERENCE BETWEEN CHART MEASURED AND SATELLITE DERIVED COORDINATES  
+ values of latitude are north of satellite position, + values of longitude are west of satellite position.

LOCATION	# OBS USED	TABLE NO.	Difference Latitude	Difference Longitude	CHART SCALE	YEAR
Honolulu, Pier 18	66	1A-1	+ 11.8" (364m)	+ 9.1" (262m)	1:5,000	1974
Honolulu, Pier 18	44	1A-2	+ 11.6" (358m)	+ 9.3" (268m)		
Honolulu, Pier 18	29	1A-3	+ 11.1" (343m)	+ 9.6" (276m)		
Honolulu, Pier 18	30	1A-5	+ 11.7" (361m)	+ 9.1" (262m)		
Honolulu, Pier 18	31	1A-6	+ 11.3" (349m)	+ 8.9" (256m)		
Honolulu, Pier 18	102	1A-7	+ 11.5" (355m)	+ 9.5" (273m)		
Honolulu, Pier 18	252	1A-8	+ 11.8" (364m)	+ 9.1" (262m)		
Honolulu, Pier 10	5	1A-4	+ 10.7" (331m)	+ 9.8" (282m)		
Honolulu, Pier 40	11	1A-9	+ 10.0" (309m)	+ 9.2" (265m)		
Pago Pago, Oil Dock	21	2A-1	+ 10.1" (312m)	+ 14.2" (425m)	1:15,000	1973
Suva, King's Wharf	7	3A-1	+ 13.1" (405m)	+ 8.4" (247m)	1:12,150	1975
Suva, Dolphins	8	3A-2	+ 4.5" (139m)	+ 7.5" (220m)		
Suva, Dry Dock	8	3A-3	+ 6.2" (192m)	+ 9.6" (282m)		
Suva, NW King's Wharf	10	3A-4	+ 4.2" (130m)	+ 12.8" (376m)		
Suva, Dolphins	56	3A-5	+ 7.6" (235m)	+ 12.7" (373m)		
Suva, Dolphins	81	3A-6	+ 6.8" (210m)	+ 12.8" (376m)		

TABLE 6 (continued)

LOCATION	# OBS USED	TABLE NO.	LATITUDE	DIFFERENCE	LONGITUDE	CHART SCALE	YEAR
Surva, 500' King's Wharf	15	3A-7	+ 5.1" (158m)	+ 13.2"	(387m)		
Surva, Gov't Slipway	28	3A-8	+ 5.6" (173m)	+ 13.9"	(408m)		
Rabaul, Main Dock	5	4A-1	+ 8.6" (266m)	- 10.0"	(308m)	1:25,000	1966
Guam, Dillingham Pier	13	5A-1	- 6.7" (207m)	- 10.2"	(306m)	1:10,000	1975
Guam, Dillingham Pier	6	5A-2	- 7.1" (219m)	- 9.6"	(288m)		
Majuro, "T" Wharf	4	6A-1	+ 5.0" (154m)	+ 1.4"	( 43m)	1:35,000	1974
Ponape, Main Dock	24	7A-1	+ 27.3" (843m)	+ 57.0"	(1748m)	1:25,000	1973
Palau, Main Dock	37	8A-1	- 10.3" (318m)	+ 26.5"	(812m)	1:10,000	1972
Wellington, Glasgow Wharf	43	9A-1	+ 5.8" (179m)	+ 0.5"	( 12m)	1:12,000	1975
Callao, 9-D	70	10A-1	+ 9.4" (290m)	+ 45.5"	(1375m)	1:10,000	1972
Callao, 4-A	54	10A-2	+ 33.6" (1038m)	+ 53.0"	(1601m)		
Ancon, Anchored	8	11A-1	- 1.5" ( 46m)	+ 5.3"	(160m)	1:36,481	1923
Talara, Anchored	11	12A-1	- 15.5" (479m)	- 39.6"	(1219m)	1:10,000	1976
Guayaquil, #2	73	13A-1	- 12.8" (395m)	- 6.9"	(211m)	1:10,000	1973
Guayaquil, #2	45	13A-2	- 12.8" (395m)	- 7.0"	(215m)		
Guayaquil, Tiuna	12	13A-3	- 11.1" (343m)	- 10.2"	(313m)		
Guayaquil, #6	3	13A-4	- 10.4" (321m)	- 11.1"	(340m)		

TABLE 6 (continued)

LOCATION	# USED	TABLE NO.	DIFFERENCE LATITUDE	DIFFERENCE LONGITUDE	CHART SCALE	YEAR
Puntarenas, Anchored	11	14A-1	+ 2.7" ( 83m)	+ 2.1" ( 64m)	1:12,500	1976
Acapulco, Main Dock	12	15A-1	- 6.8" (210m)	- 5.9" (174m)	1:25,000	1974
Acapulco, Main Dock	5	15A-3	- 6.8" (210m)	- 7.2" (213m)		
Acapulco, W of Main Dock	26	15A-2	- 7.7" (238m)	- 7.2" (213m)		
Midway, Main Pier	13	16A-1	- 14.4" (445m)	- 2.4" ( 65m)	1:32,500	1973
Papeete, Main Wharf	7	17A-1	+ 18.0" (556m)	- 13.3" (392m)	1:5,000	1975
Papeete, Fuel Dock	11	17A-2	+ 3.6" (111m)	- 2.4" ( 71m)		
Antofagasta, Sito #2	36	18A-1	- 2.7" ( 83m)	+ 58.6" (1658m)	1:12,500	1976
Easter Island, Anchored	12	19A-1	- 30.4" (939m)	+ 11.6" (319m)	1:23,173	1975
Pitcairn Island, Anchored	6	20A-1	- 11.0" (340m)	- 1.2" ( 34m)	1:24,079	1972
Valparaíso, Berth #4	25	21A-1	- 5.5" (170m)	+ 17.3" (448m)	1:8,000	1976
Balboa, Pier #2	55	22A-1	+ 5.1" (158m)	+ 9.6" (293m)	1:12,500	1976

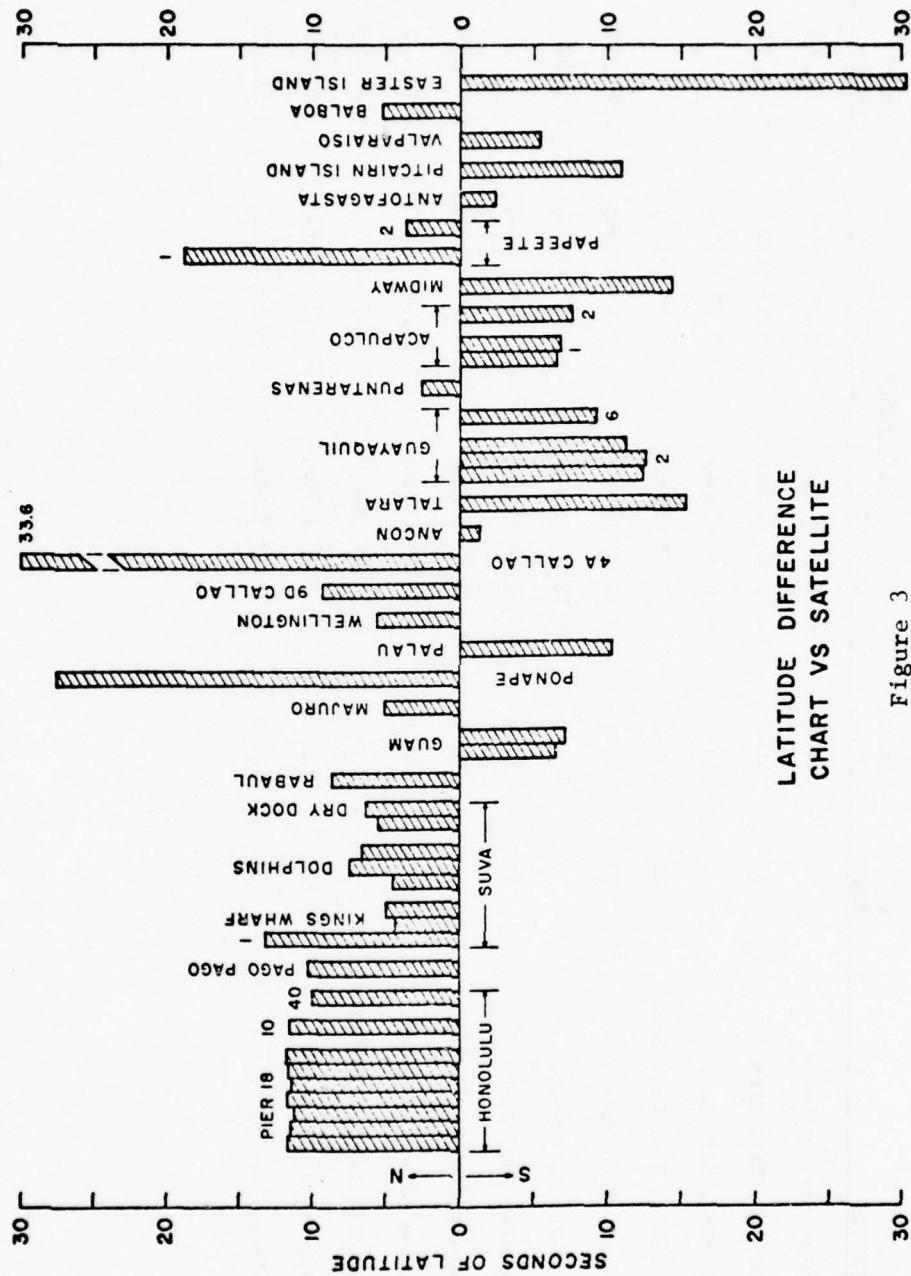


Figure 3



places. As these errors are not related to either the date of issue of the charts or chart scales, they are either real, or represent abnormalities in the satellite data. This last is postulated on the basis of poor agreement indicated for nearby locations in a harbor using the same chart. See for example, Suva and Callao. Whereas in Suva there is probably an error related to the use of a wrong initialized antenna height for one set of data there is a different kind of problem at Callao. This was noted by Berg (1976) in using the double pass method to establish a position for Callao. Berg could not resolve this discrepancy which he attributes to "causes unknown". However, it could be related to local electrical field interference as noted by Woppard and Thompson (1974) at Bogota in connection with television broadcasts. As Berg (1976) does not comment on problems in using the double pass method at sites other than Callao, his position determinations for Ponape, Palau, Talara, Antofagasta and Easter Island, the sites indicating large errors in position as at Callao as well as Papeete (site 1), were examined as to degree of agreement with the writer's determinations of position. These determinations by Berg however, are not all on the same standard of quality control as that for his values for Honolulu since the rejection limit was  $3\sigma$  for most sites rather than  $2\sigma$  for the standard deviation values. For purposes of comparison with the writer's determinations of position, Berg's solution with Doppler counts greater than 5 were used where available and where the count was less than 5 the site is marked with an asterisk.

		BERG (1976)	THIS STUDY	DIFFERENCE RELATIVE TO BERG
<b>Palau</b>	Lat	7°19.8248' (19°49.50")	7°19'49.34"	- 0.16"
	Long	134°27.3982' (27°23.88")	134°27'23.49"	- 0.39"
<b>Ponape*</b>	Lat	6°38.7471' (58°44.82")	6°58'44.74"	- 0.08"
	Long	158°12.030 (12°01.80")	158°12'01.97"	+ 0.17"
<b>Talara*</b>	Lat	4°33.7412' (33°44.46")	4°33'44.51"	+ 0.06"
	Long	81°17.3455' (17°20.73")	81°17'20.44"	- 0.29"
<b>Antofagasta</b>	Lat	23°39.2241' (39°13.44")	23°39'13.70"	+ 0.26"
	Long	70°24.3384' (24°20.30")	70°24'20.40"	+ 0.10"
<b>Papeete*</b>	Lat	17°32.0200' (32°01.20")	17°32'01.50"	+ 0.30"
	Long	149°34.3618' (34°21.68")	149°34'21.80"	+ 0.18"

Note: Easter Island was not determined by Berg.

As seen from the above comparisons the difference in values is random in sign, and nowhere exceeds 0.39" and on average is 0.21" which is insignificant in comparison with the observed difference between the writer's determination of satellite position and the chart positions for the sites in question. The indicated difference in chart positions can therefore be regarded as real, at least in terms of the reliability of the data to approximately 0.20" in latitude and longitude. In the case of Suva the discrepancy noted for King's Wharf site 1 relative to the other two determinations at the same location is undoubtedly related to the use of the wrong initialized antenna height for this series of observations. A value of 75 meters was used for the first observations rather than the more correct height of 54 meters which was used for the later

determinations. This explanation, however, does not explain the apparent discrepancy noted between sites 1 and 2 at Papeete. The most logical explanation for these discrepancies brought out by Berg (1976) is that the ephemeris for certain satellites at times is in error. That the ship's position was located in error on the chart, or else there are discrepancies on the charts for the locations shown for some of the port facilities, is not regarded as being as an important source of error.

As none of the discrepancies between chart positions and satellites positions exceed 1 minute of arc in either latitude or longitude, it would appear that all the charts used have at least this degree of reliability, and most a reliability of better than 20 seconds in both latitude and longitude.

#### CONCLUSIONS

In this study of the reliability of charted positions for port locations in the Pacific area using the Navy Navigation Satellite System as a standard for evaluating position location, several points were brought into focus concerning the reliability of satellite defined positions that had not been anticipated in advance of undertaking this study. Although outside the primary objective of the study, the general importance of these auxiliary findings appears to make them worthy of inclusion as one of the principal results obtained from this study since for the most part

they are not alluded to in previously published papers on the reliability of satellite defined positions so far as the writer is aware. These can be summarized briefly as follows. (1) The standard deviations in satellite-defined values of position of latitude and longitude using all satellite passes are not improved by having multiple observation samples in excess of 55 observations. (2) The distribution of values of standard deviation for a series of multiple passes converges as the number of passes increases towards an intermediate value between a minimum and maximum value which is not the same for both latitude and longitude. (3) The distribution of values of standard deviation for multiple observations does not define a Gaussian (normal) distribution, but portrays a bimodal distribution that is most pronounced in the latitude observations. (4) In the case of both latitude and longitude position there are certain series of values whose standard deviations depart significantly from the other values taken as a whole. In most cases both the latitude and longitude standard deviations for the sites involved appear to be anomalous although this is not always the case. Although most of these sites having an anomalous high standard deviation value occur along the Pacific coasts of Central and South America where there is a steep gravity and geoidal gradient, an error in initialized antenna height does not appear to be the explanation for the anomalous values as other sets of values at the same sites are not anomalous. As all data were subject to the same selection and editing criteria, there is, therefore, no obvious

explanation other than that certain sets of satellite data incorporated errors in ephemeris values at times.

In terms of primary objectives of this study it was found that charted positions agreed well with satellite positions for some locations in a given port but appeared to be less good at an adjacent nearby location. In each such case it was found that the standard deviation for the satellite position was anomalously high where there were local discrepancies of the order of 5 seconds or more. Although in part such discrepancies could be related to the use of a wrong initialized antenna height in defining the satellite position, this point could only be demonstrated for one site, Suva. No relation was noted between the date of issue of a chart (all were post 1923 editions with most post 1974), or the scale of the charts, which varied from 1:5,000 to 1:36,460, and indicated errors in position. In general, agreement was within  $\pm$  15 seconds in latitude and longitude, but certain sites (Ponape, Palau, Talara, Antofagasta and Easter Island) appeared to have either one or both sets of coordinates in error by 30 seconds or more. Although a similar degree of error is indicated for Callao, this may only be an apparent error as the satellite data cannot be regarded as reliable.

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**APPENDIX A**

## ALPHABETICAL LISTING OF HARBOR CHARTS

<u>LOCATION</u>	<u>FIGURE</u>	<u>PAGE</u>
ACAPULCO	20	63
ANCON	16	59
ANTOFAGASTA	23	66
CALLAO	15	58
EASTER ISLAND	24	67
GUAM	10	53
GUAYAQUIL	18	61
HONOLULU	5, 6	48, 49
MAJURO	11	54
MIDWAY	21	64
PAGO PAGO	7	50
PALAU	13	56
PAPEETE	22	65
PANAMA	27	70
PITCAIRN ISLAND	25	68
PONAPE	12	55
PUNTARENAS	19	62
RABAUL	9	52
SUVA	8	51
TALARA	17	60
VALPARAISO	26	69
WELLINGTON	14	57

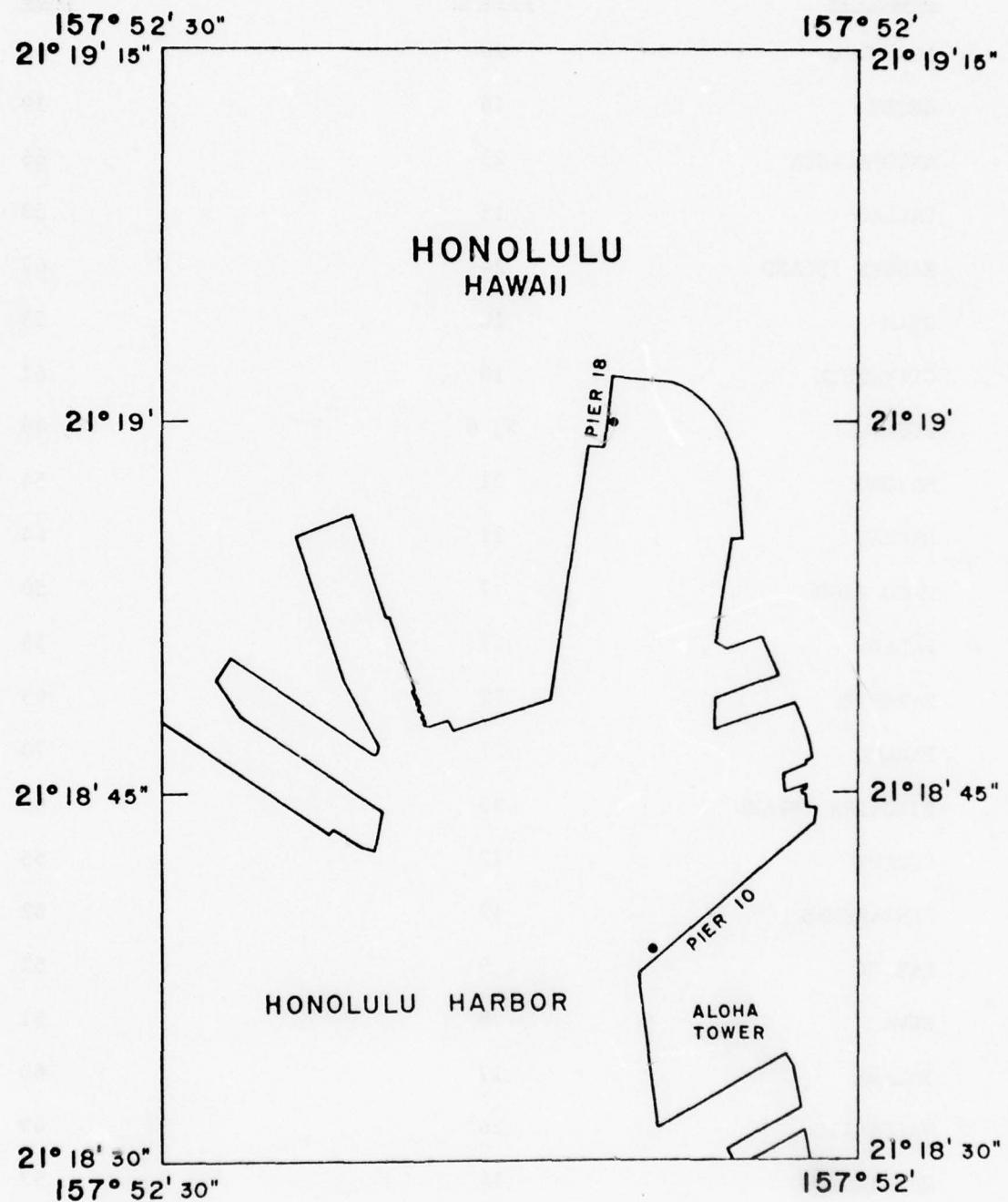


Figure 5

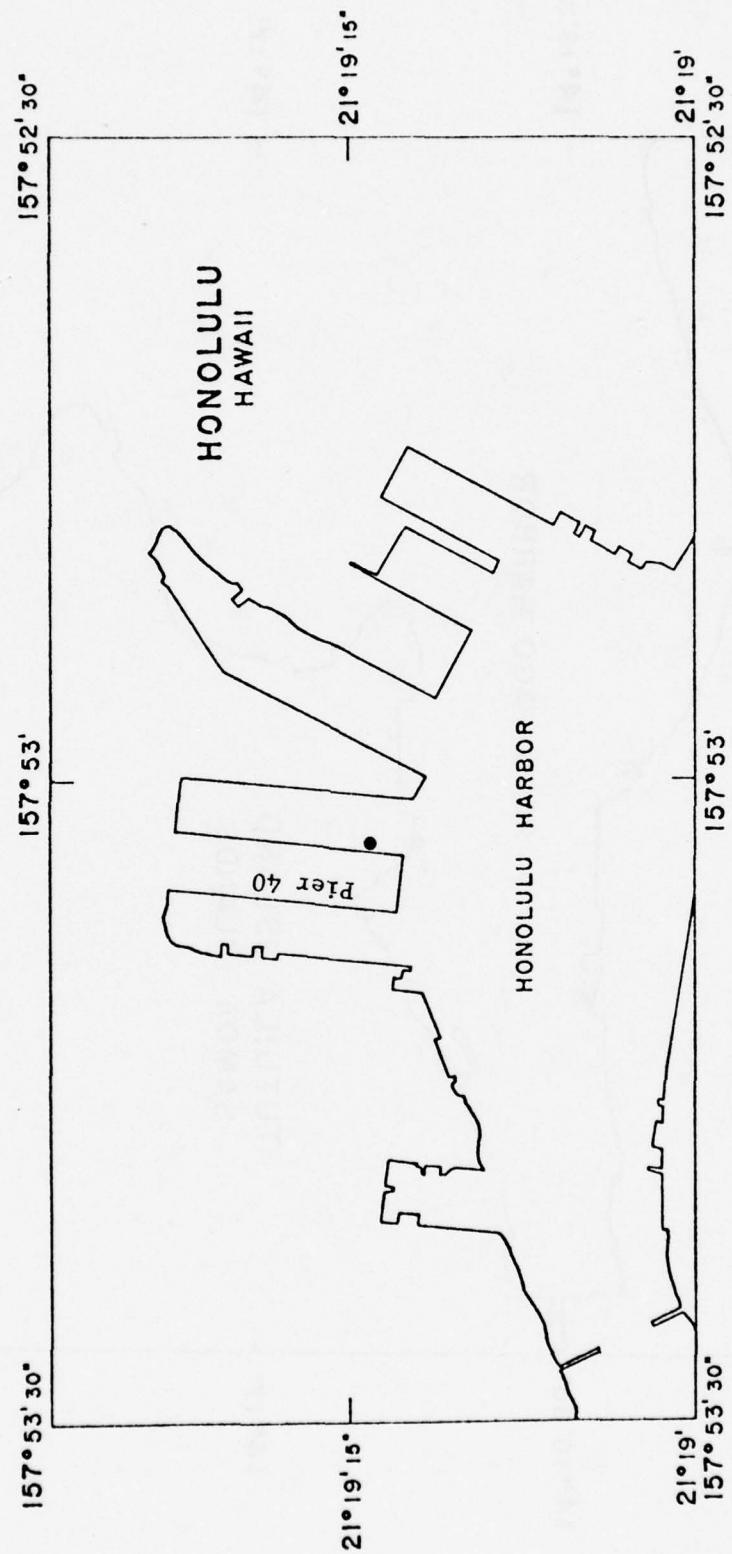
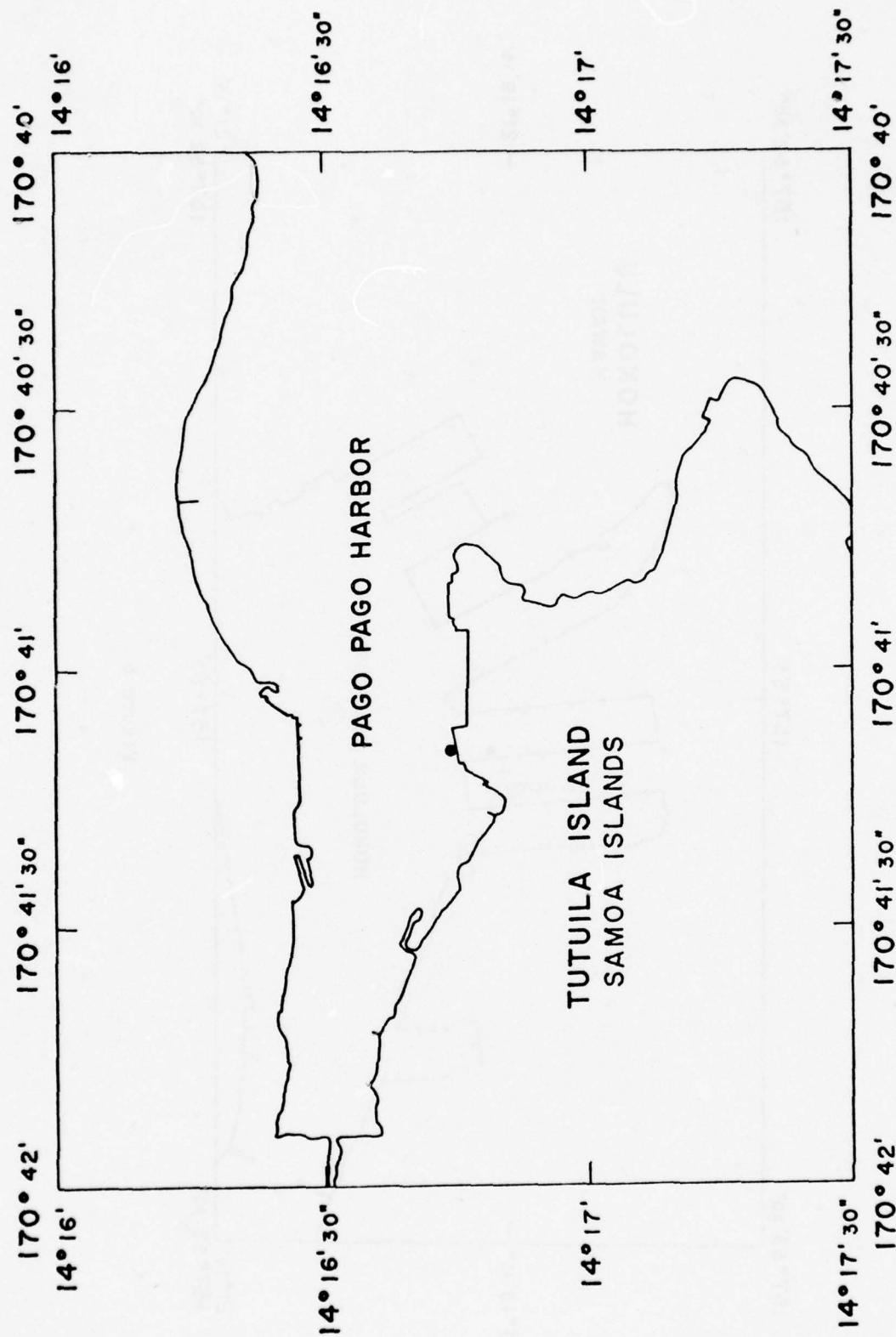


Figure 6



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Figure 7

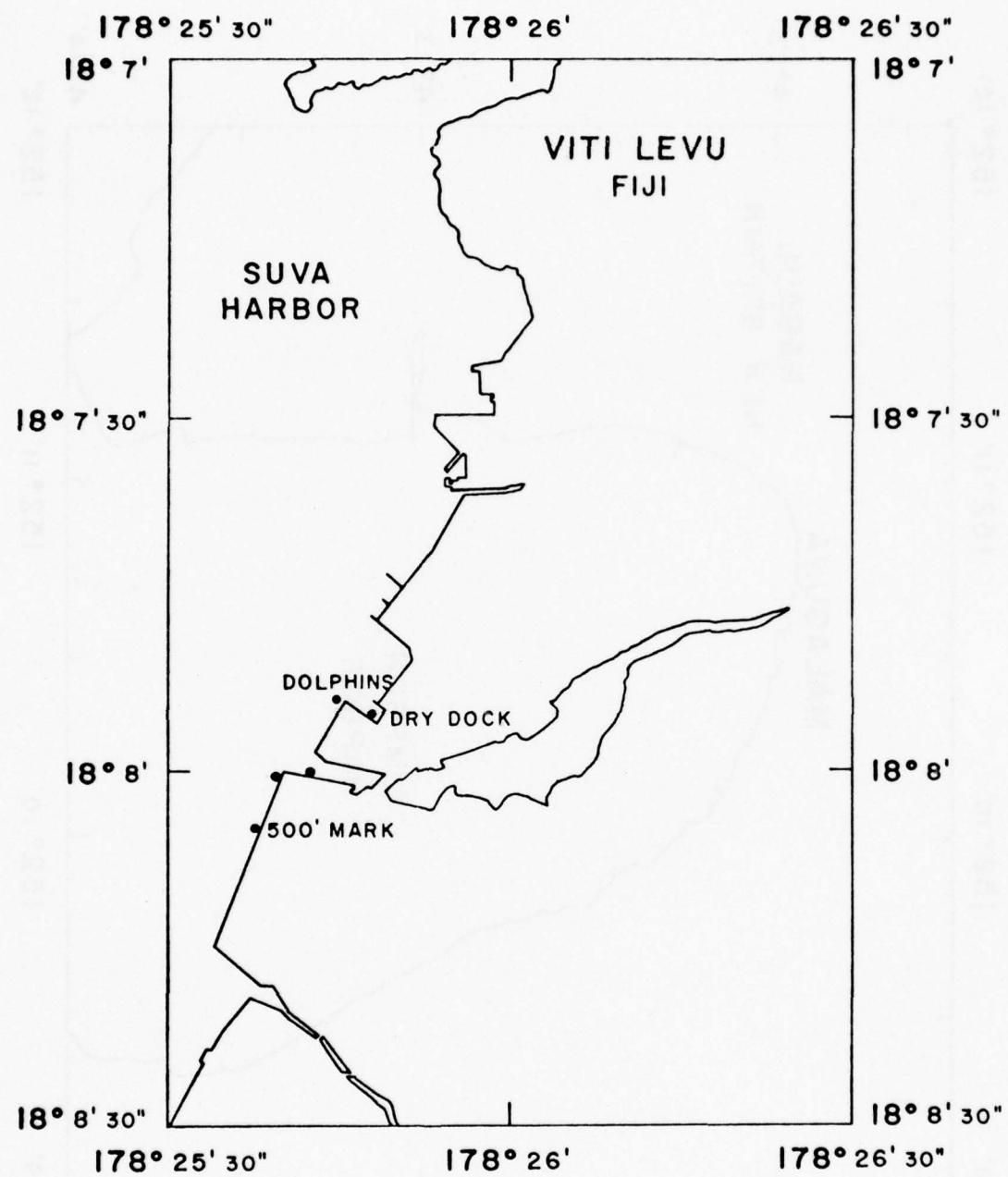


Figure 8

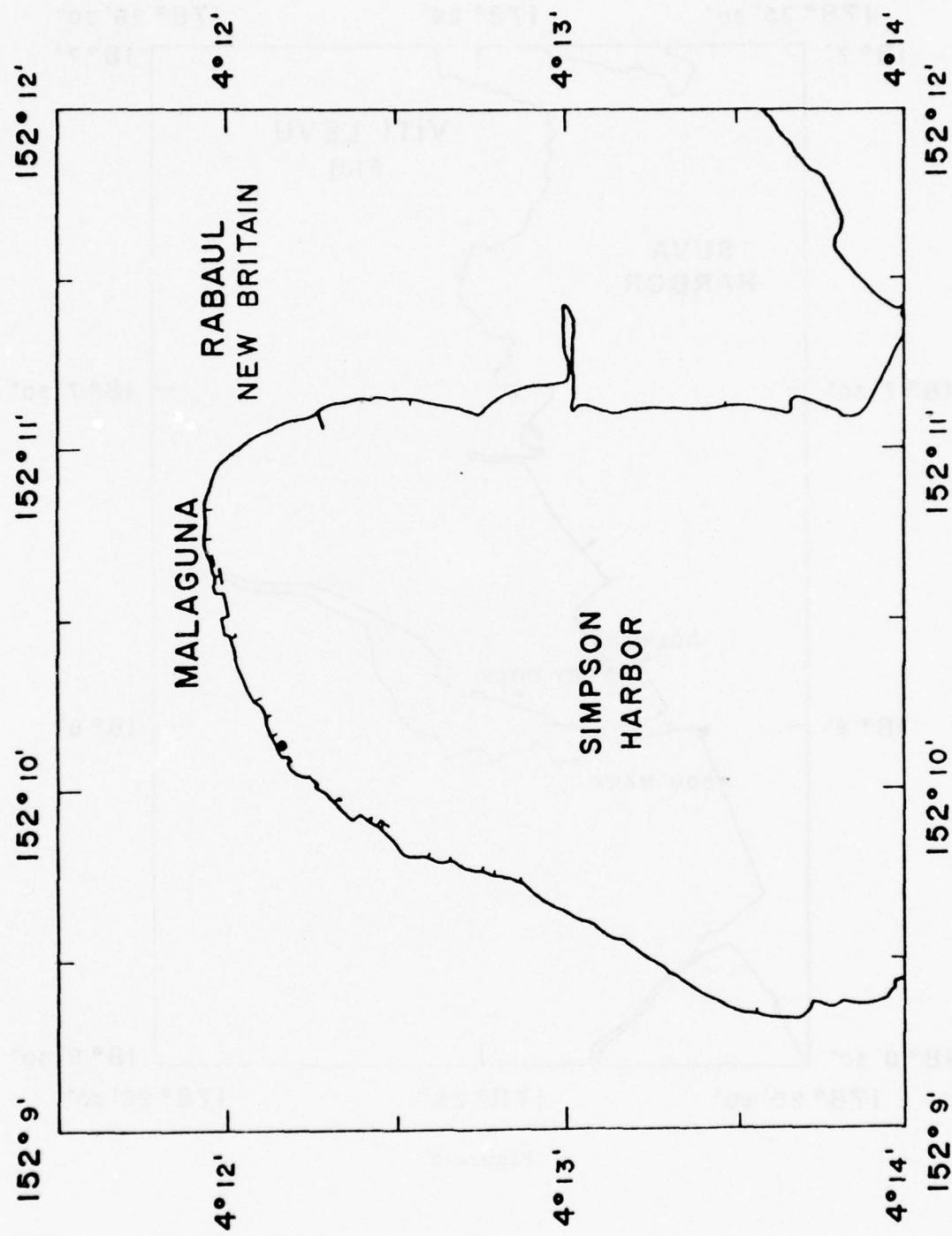


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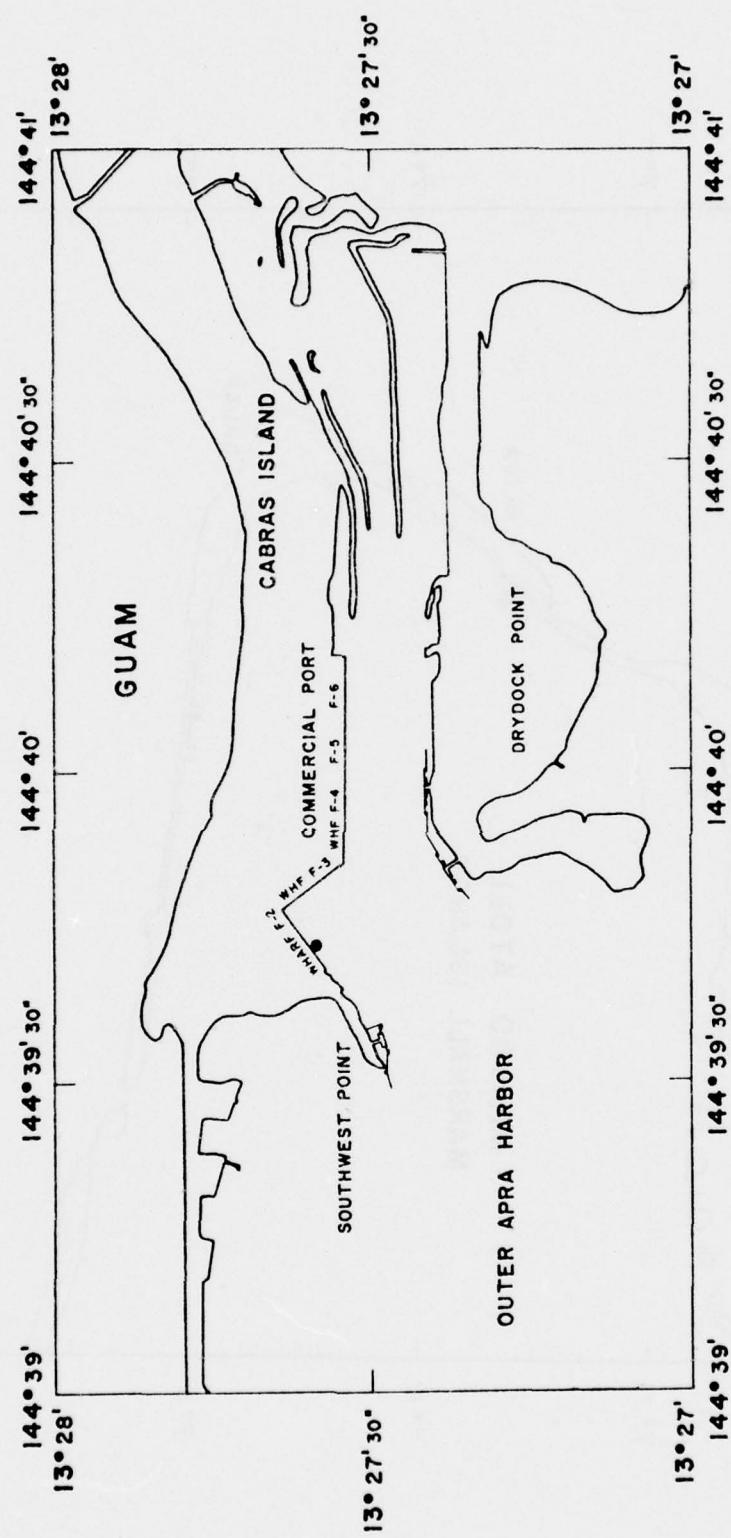


Figure 10

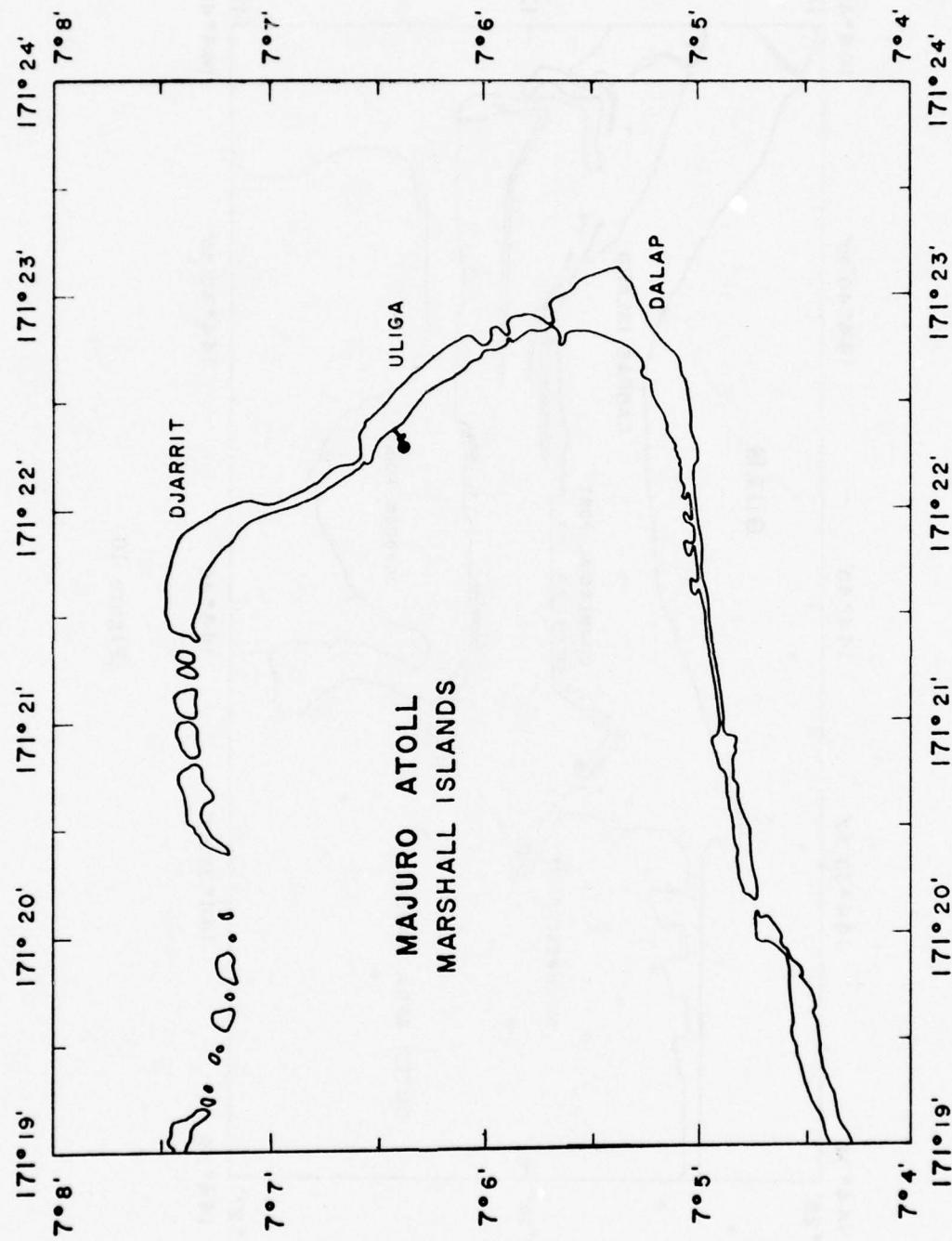


Figure 11

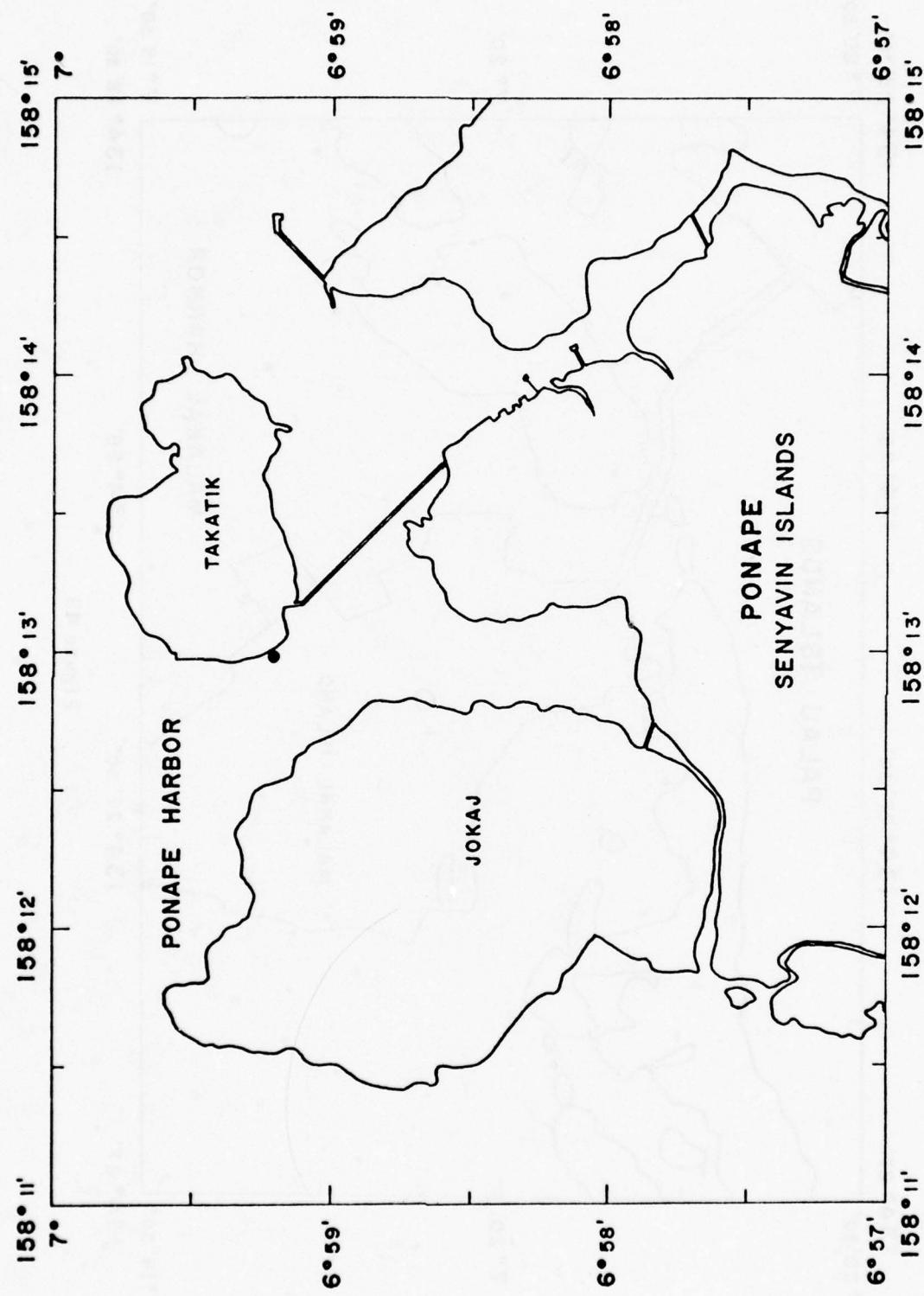


Figure 12

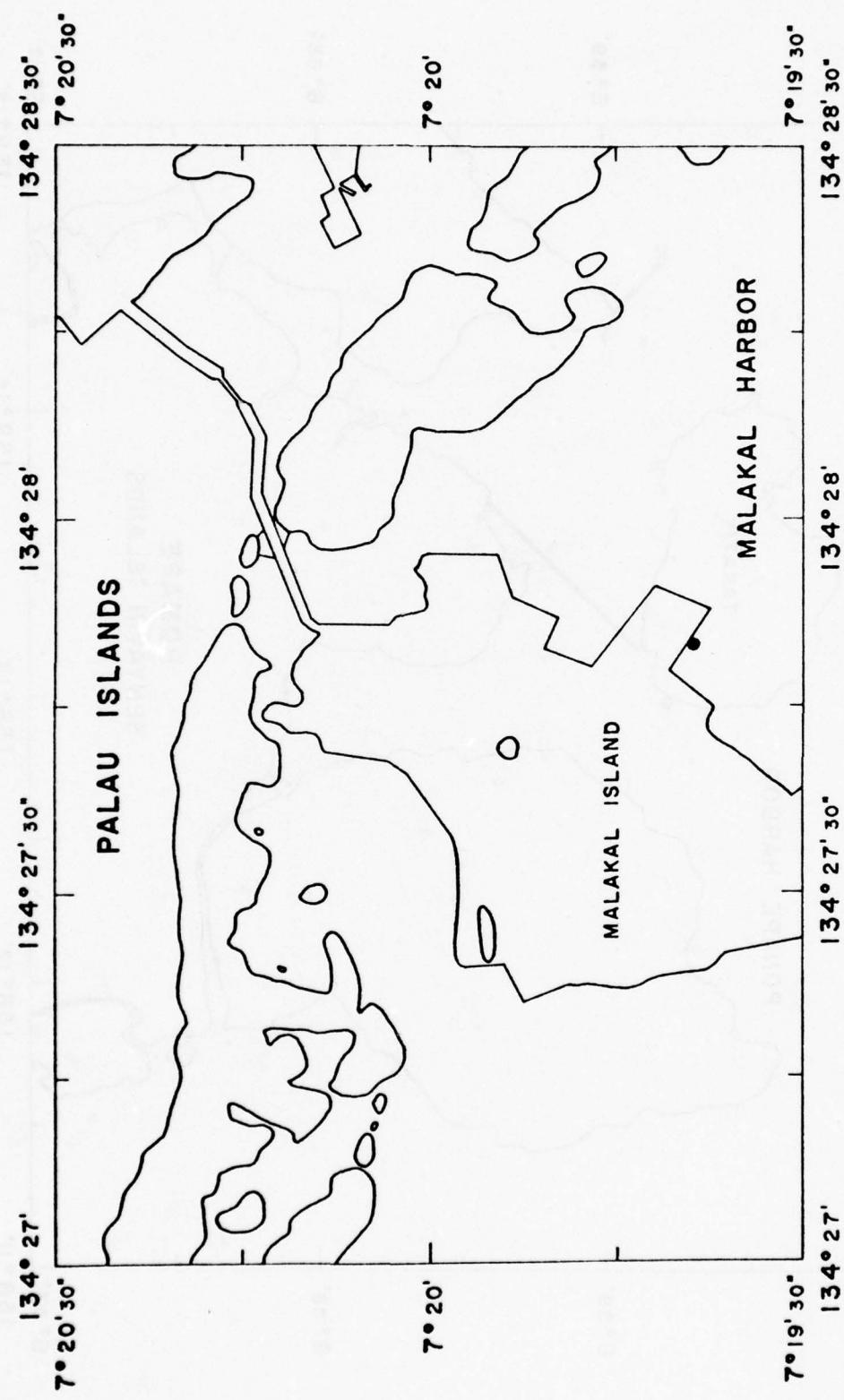


Figure 13

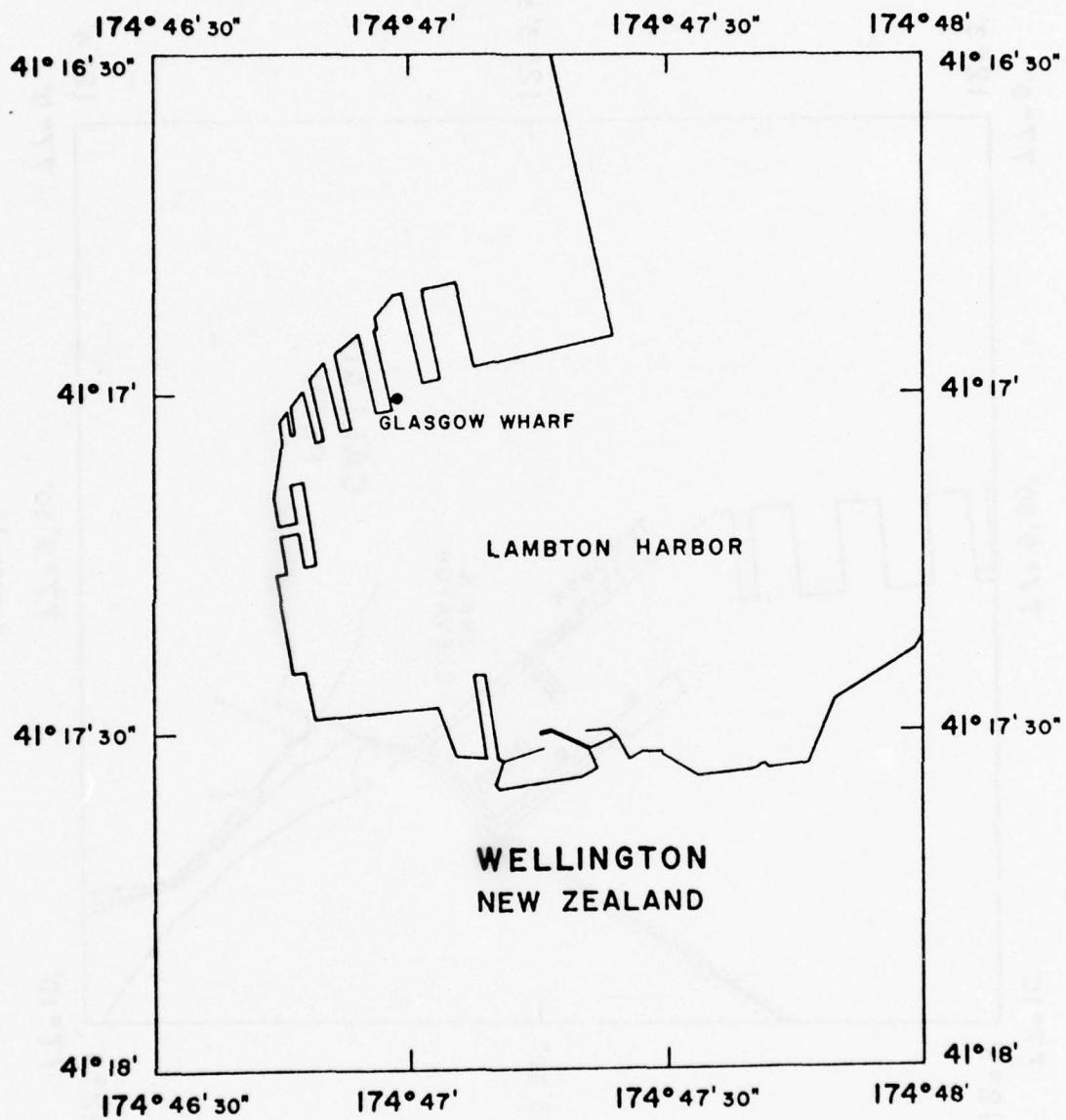


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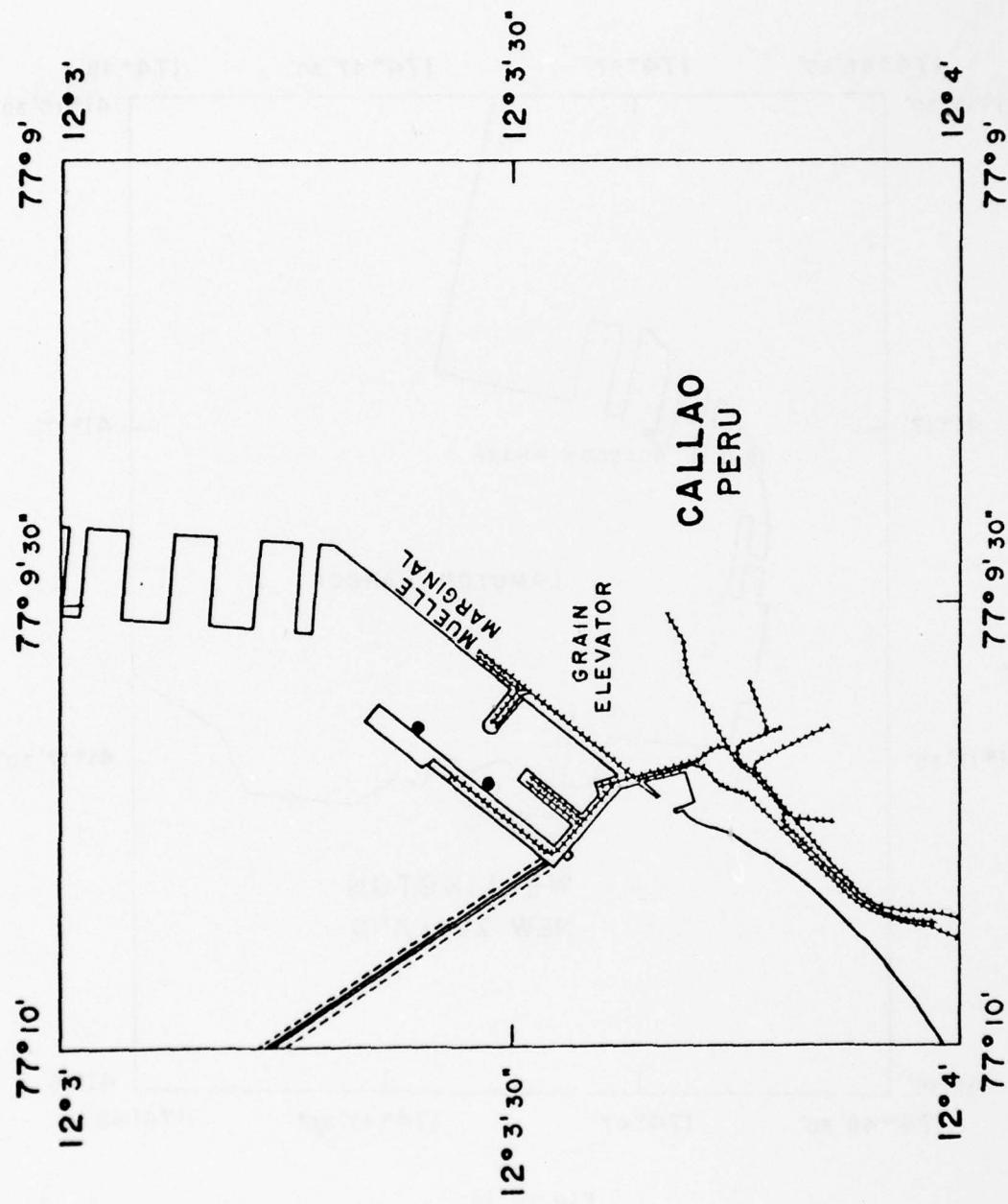


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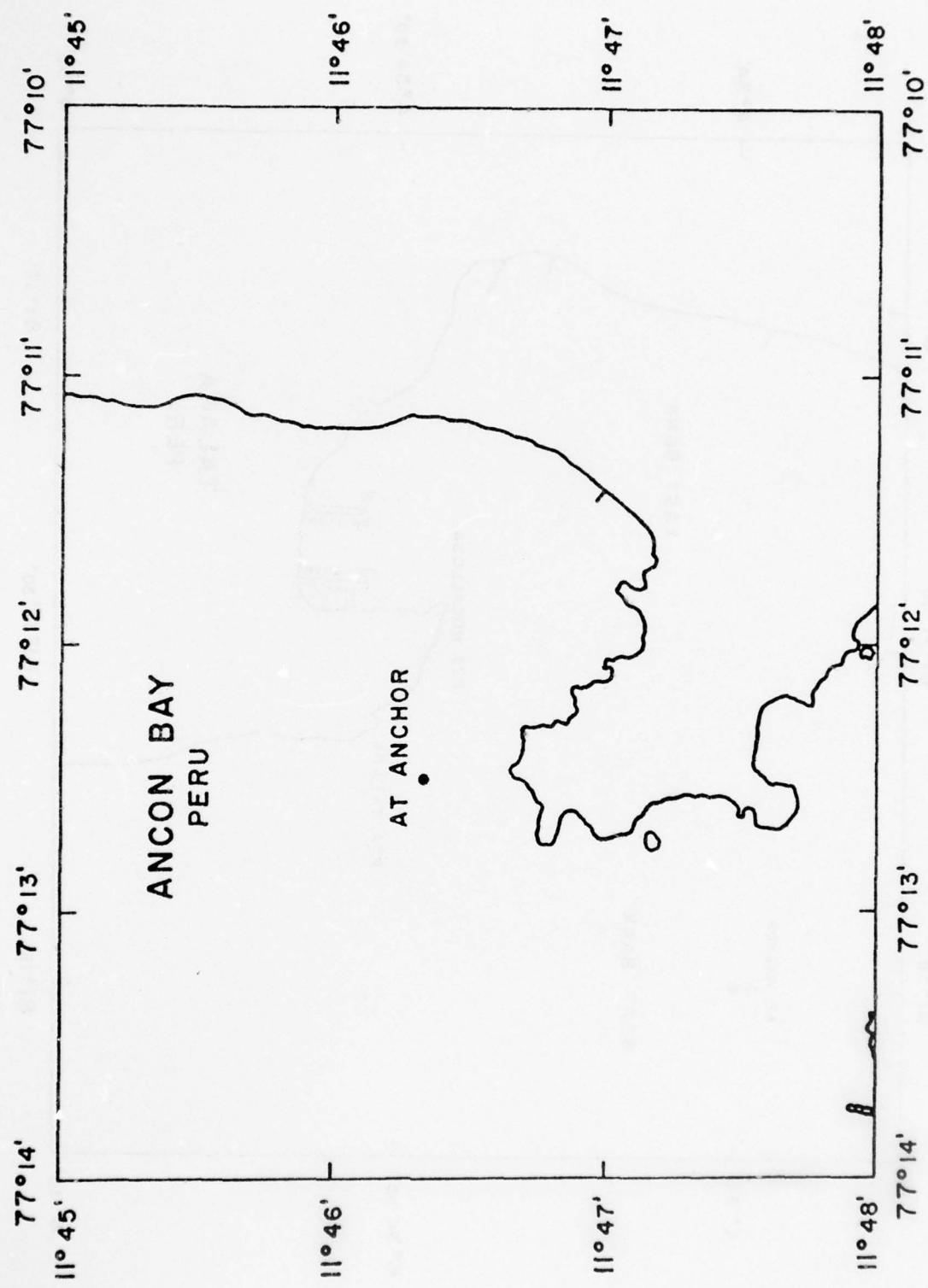


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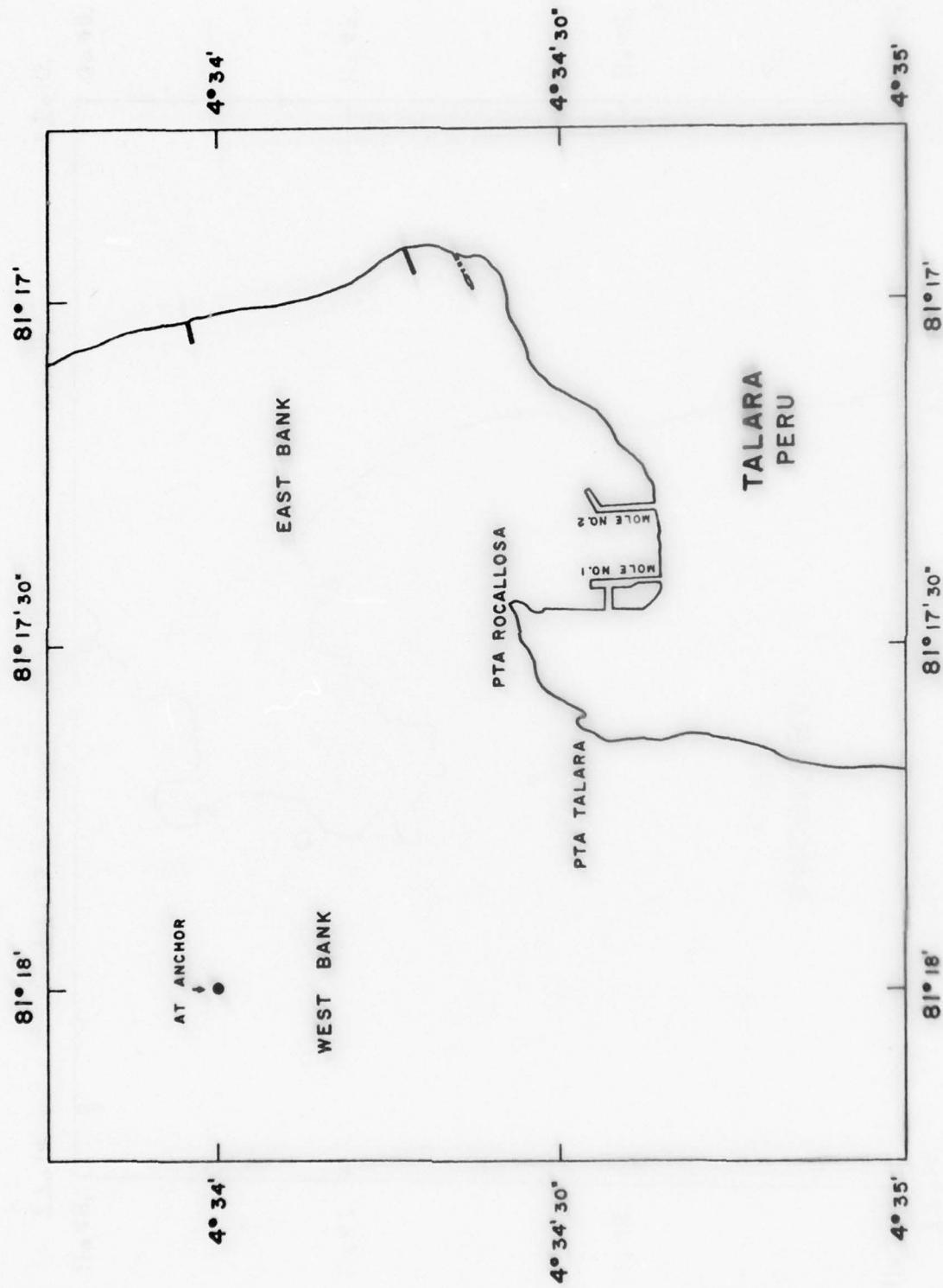


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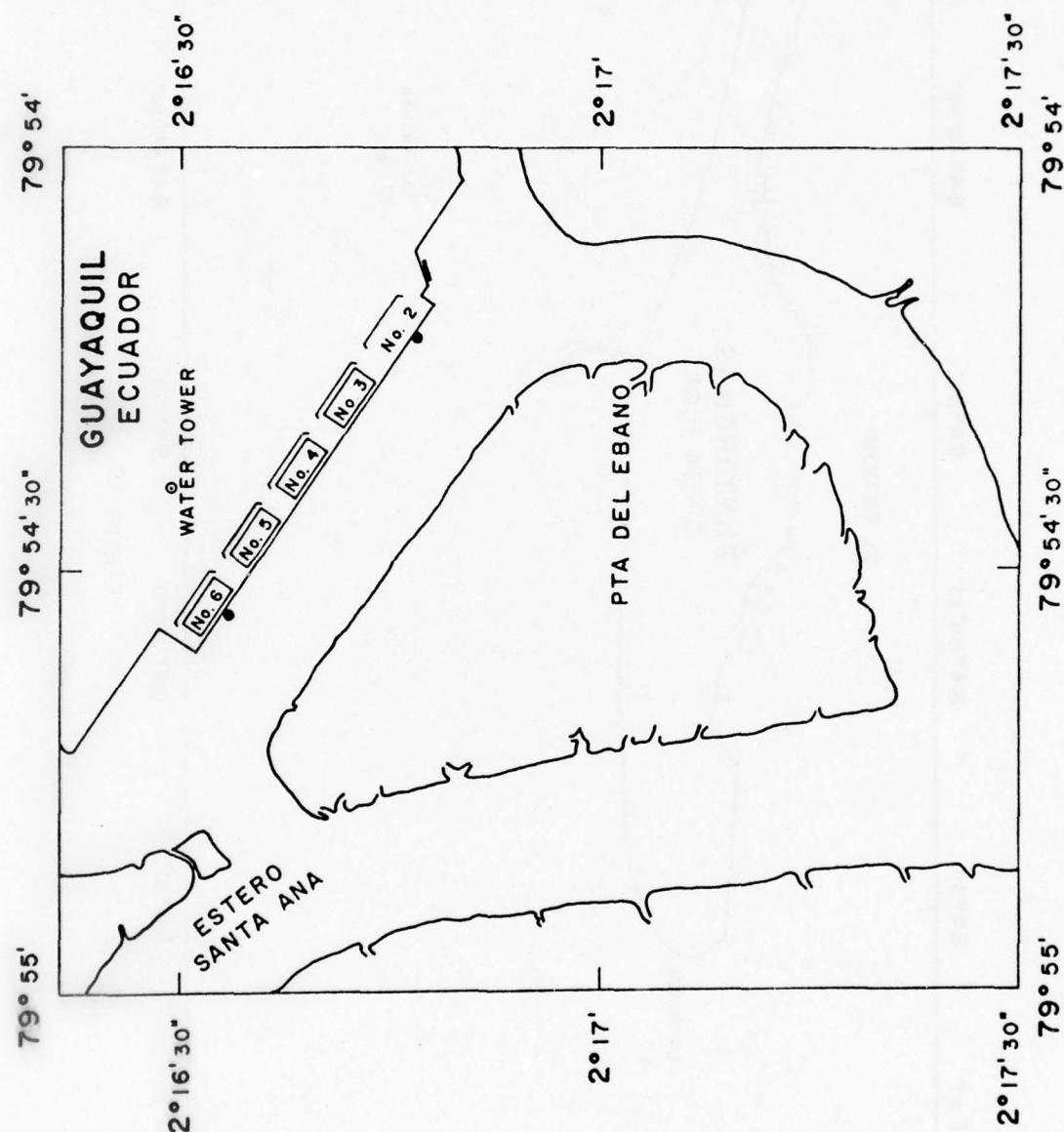


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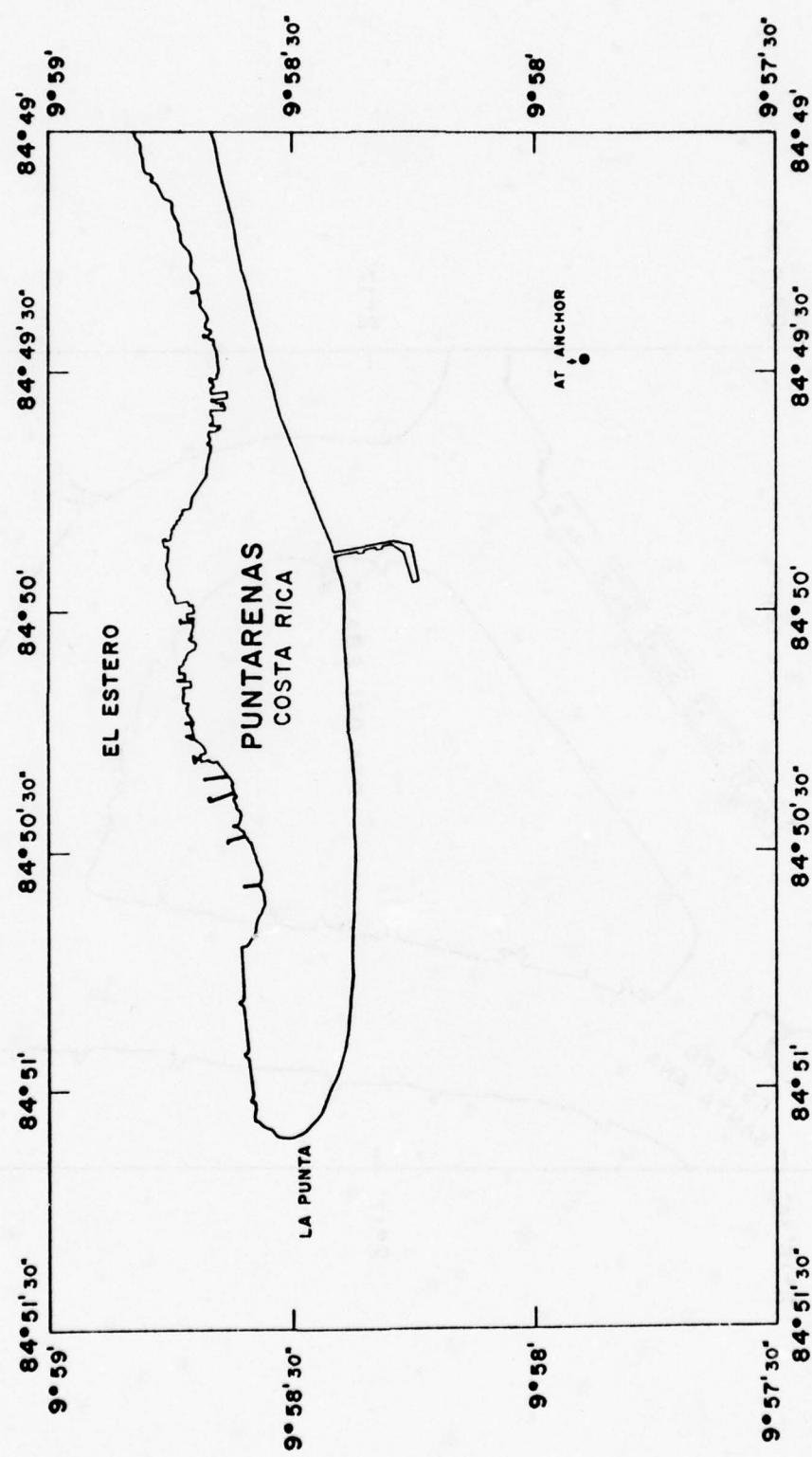
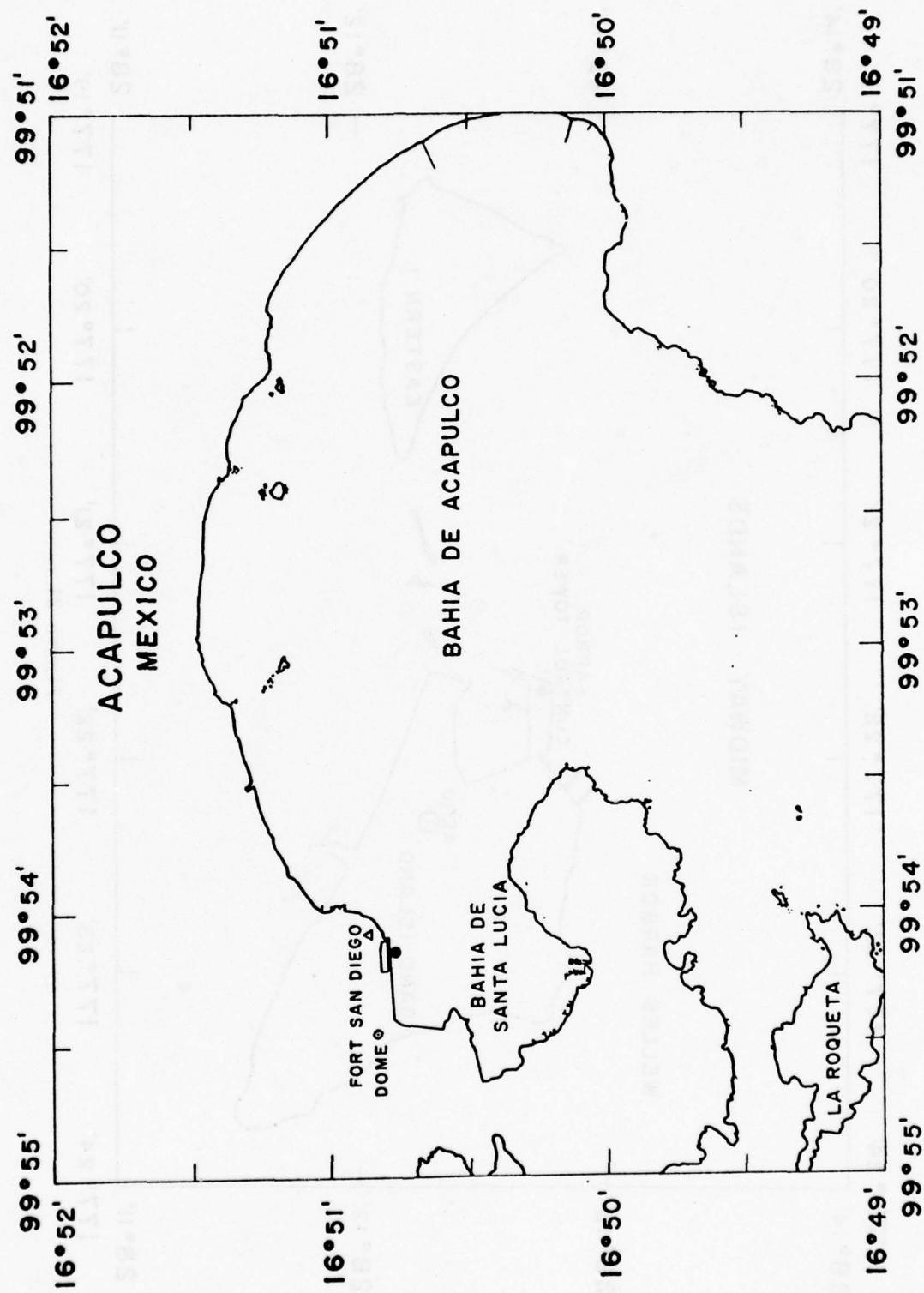
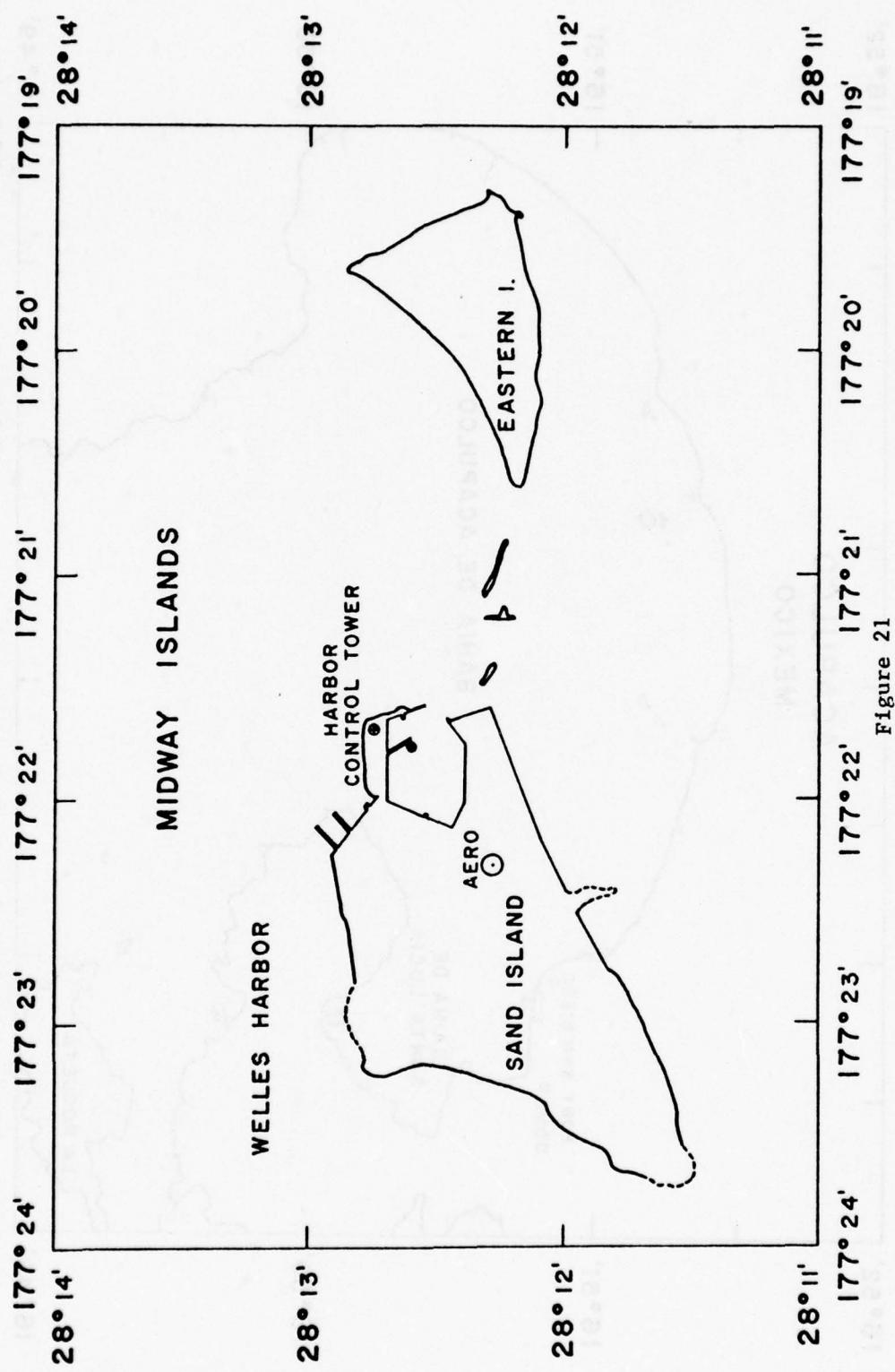


Figure 19





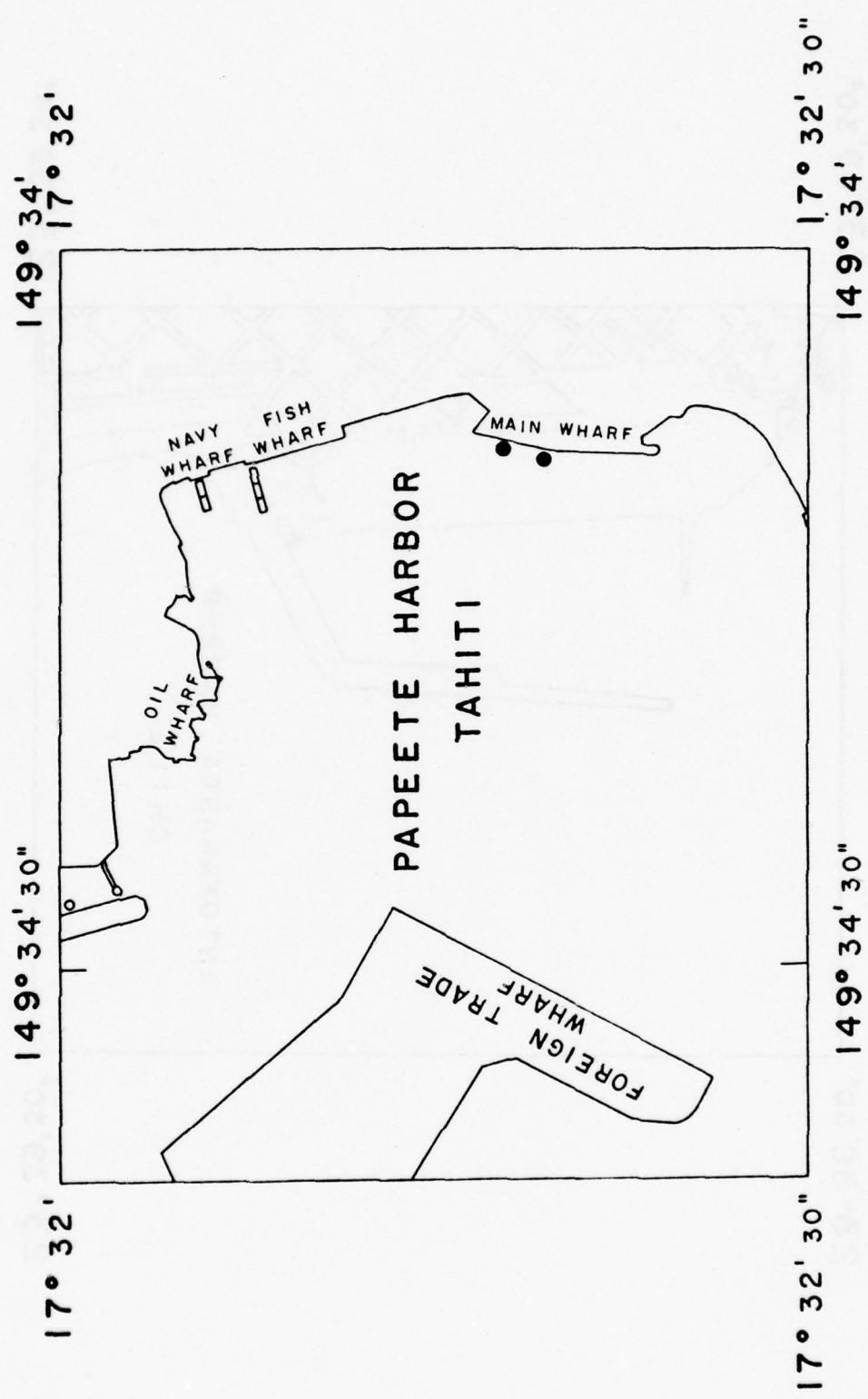


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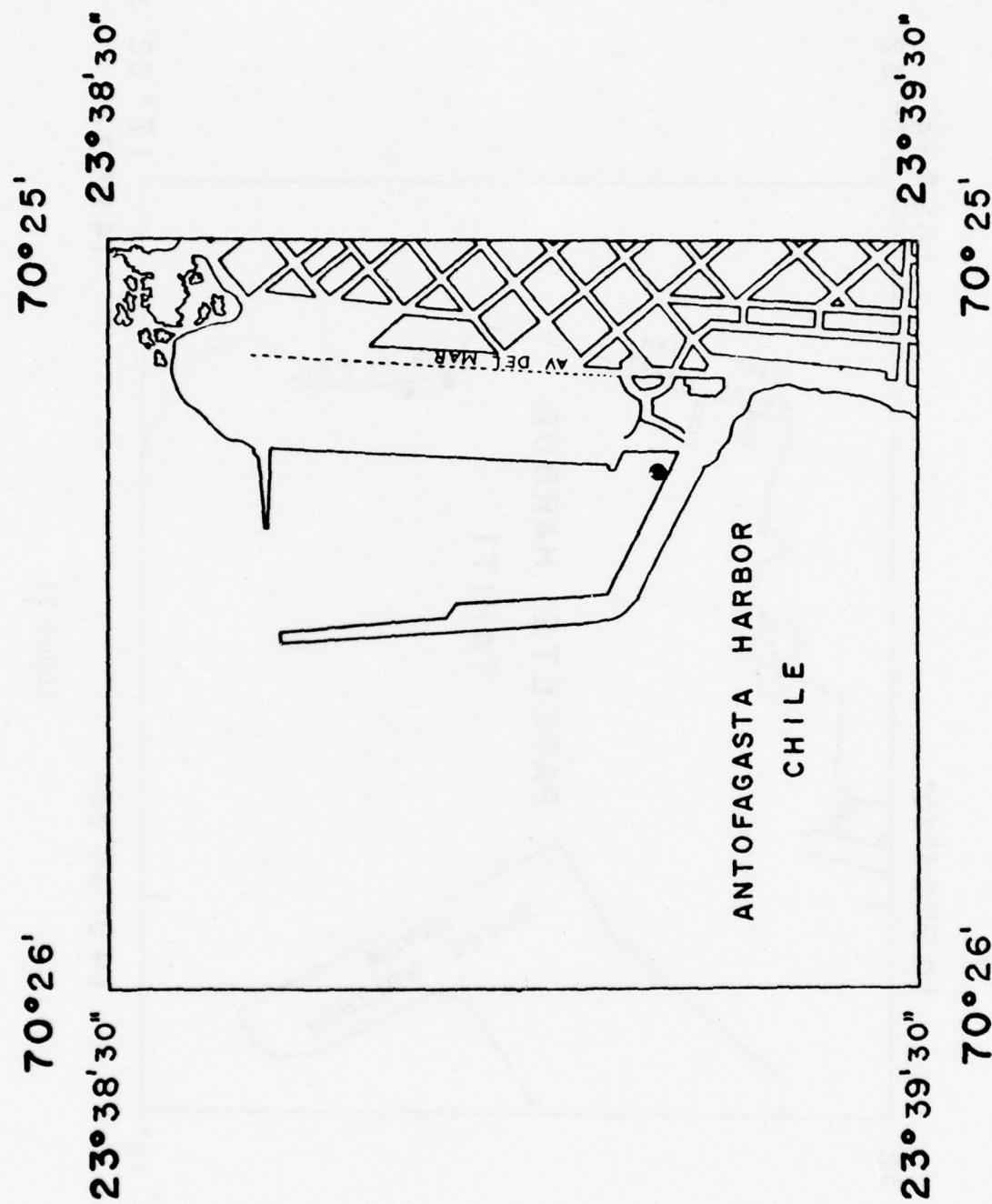


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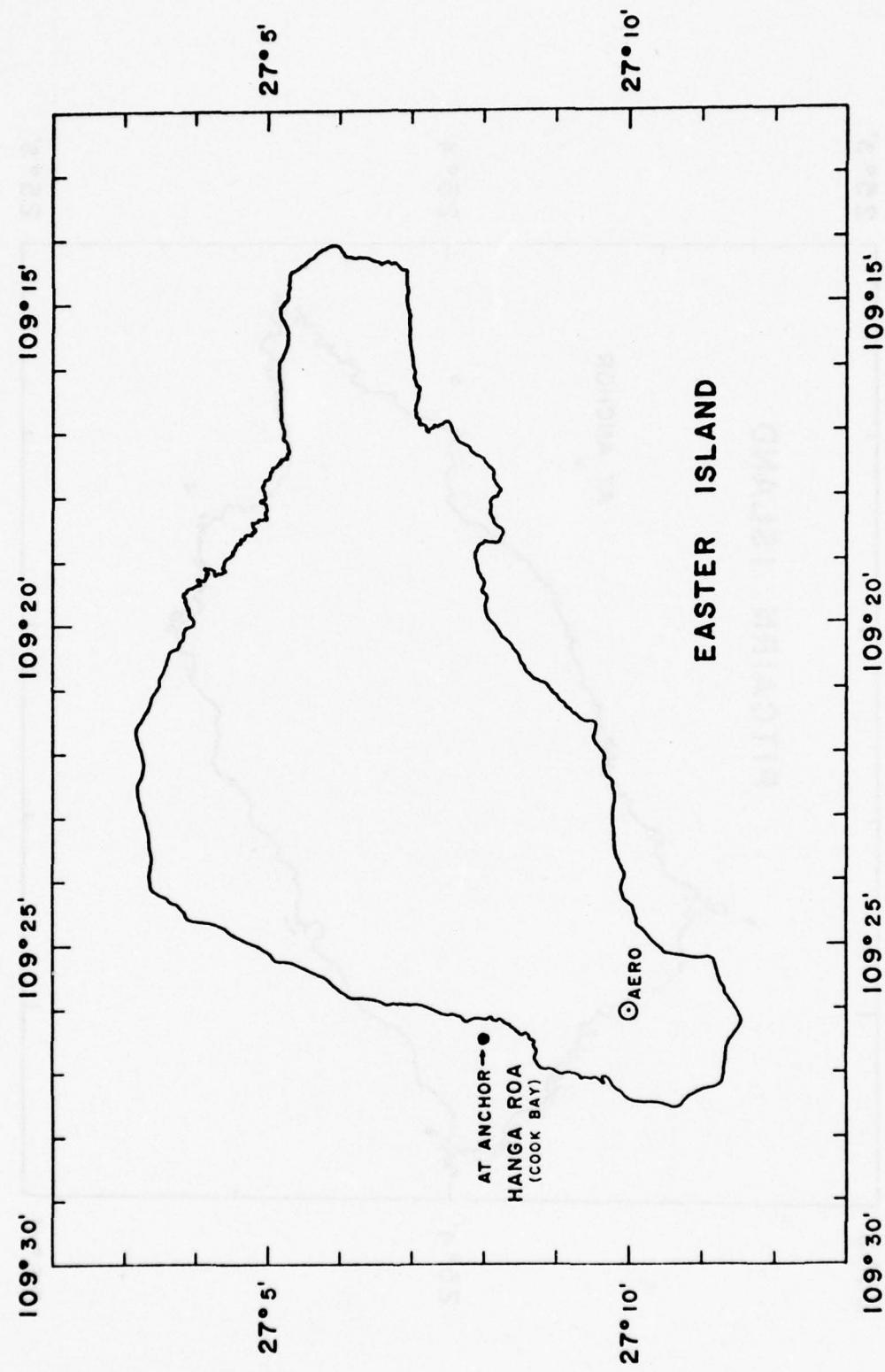


Figure 24

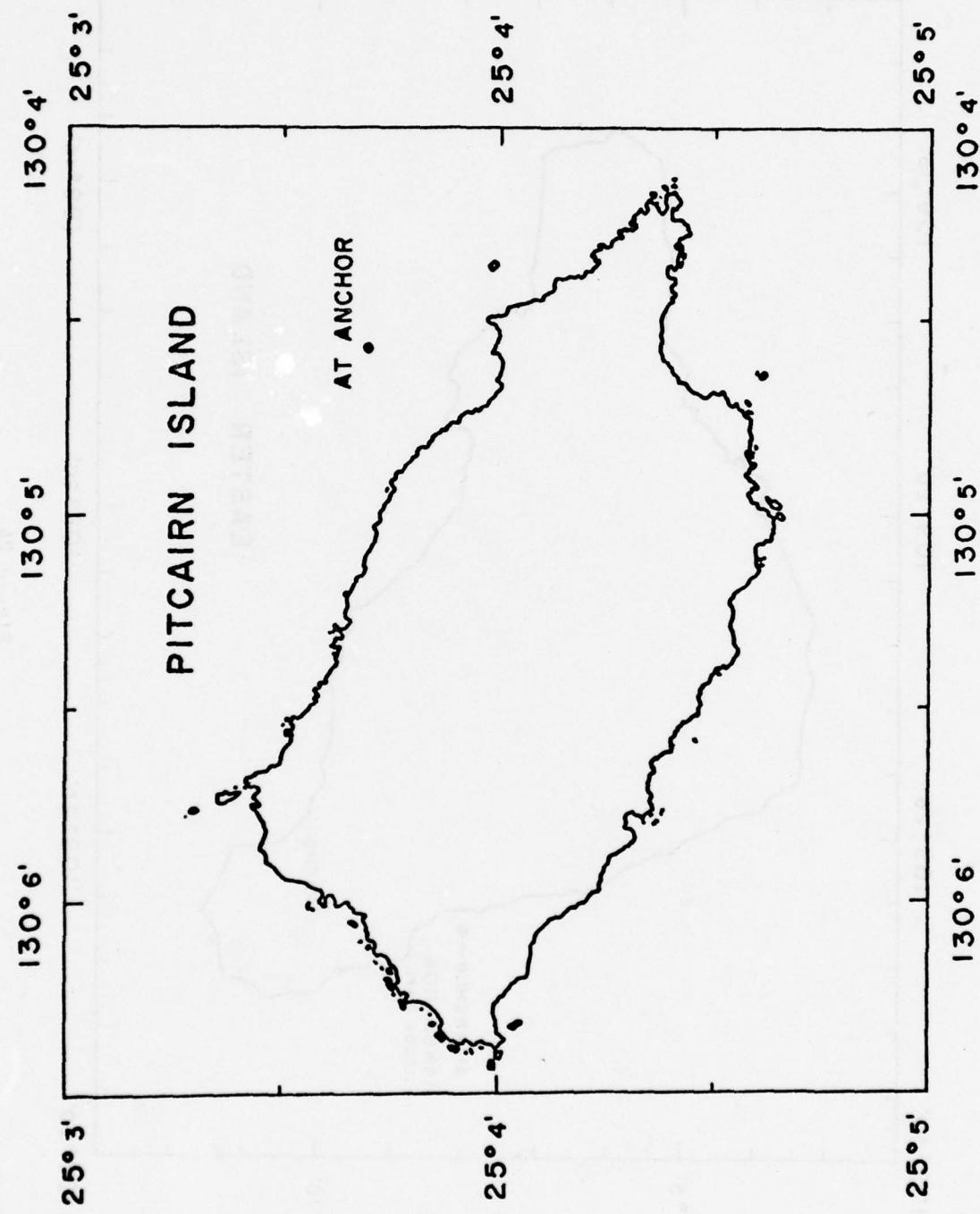


Figure 25

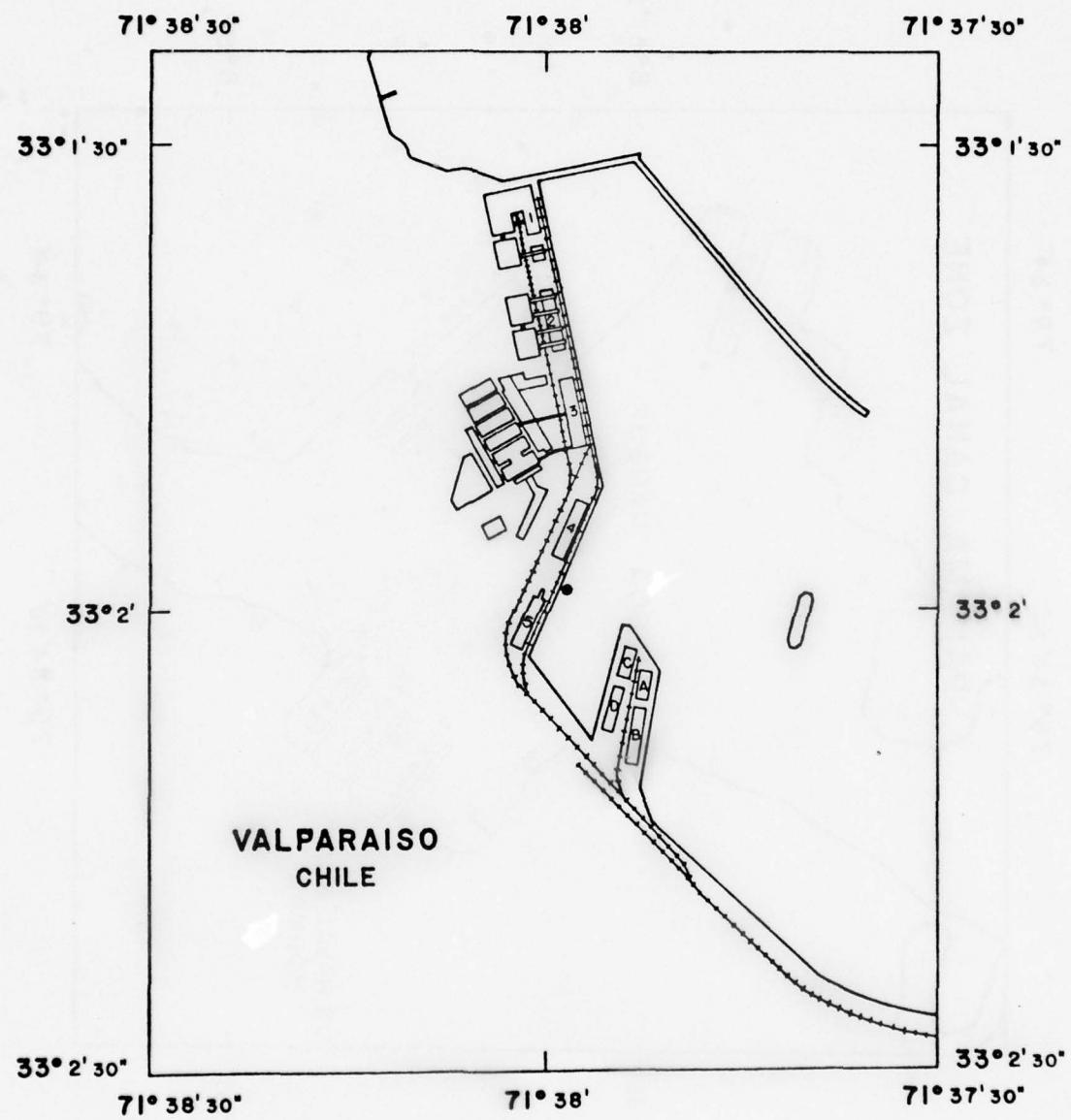


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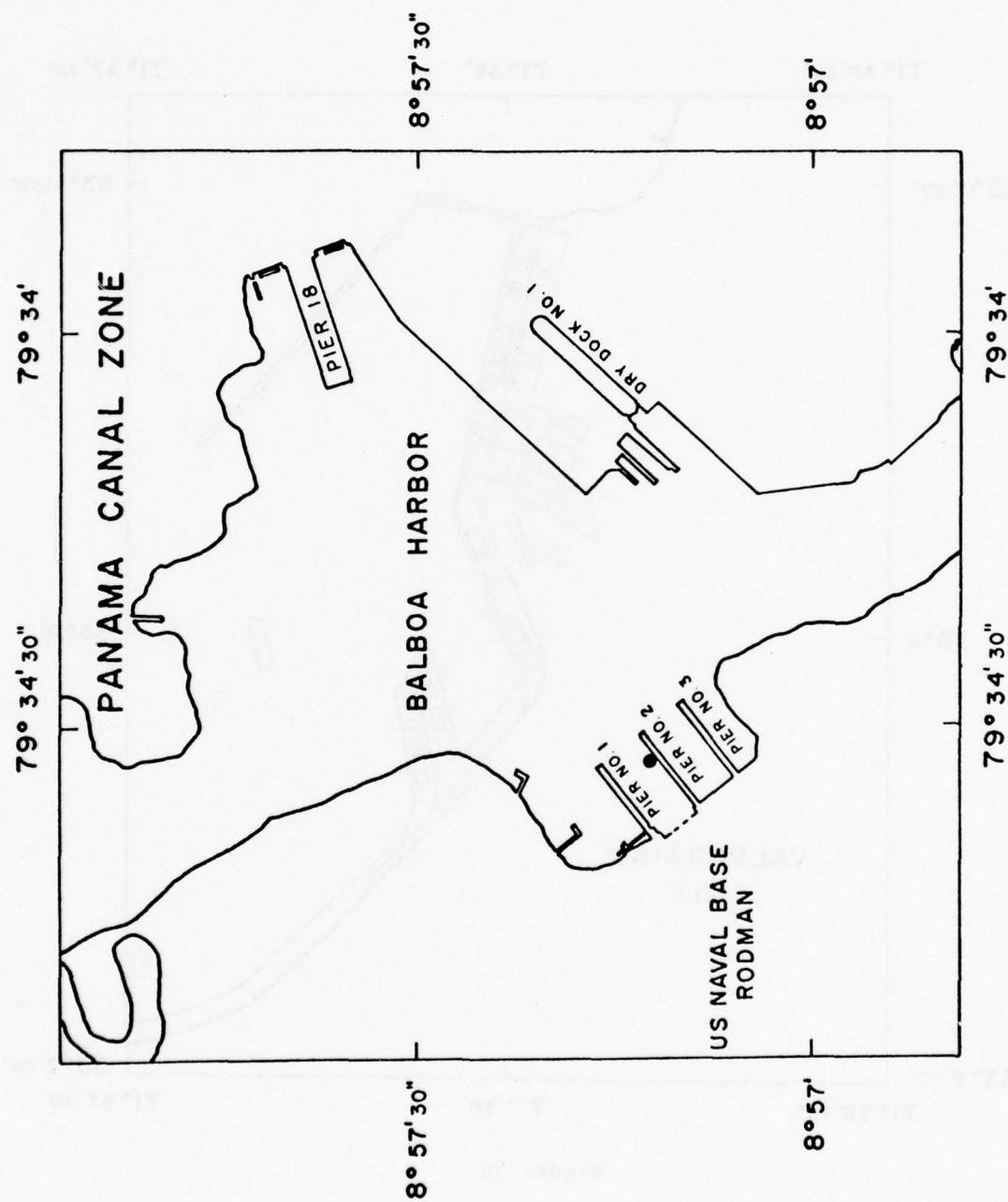


Figure 27

APPENDIX B

ALPHABETICAL LISTING OF DATA TABLES

<u>LOCATION</u>	<u>TABLE</u>	<u>PAGE</u>
ACAPULCO	15A-1 to 15A-3	122
ANCON	11A-1	113
ANTOFAGASTA	18A-1	129
CALLAO	10A-1 to 10A-2	109
EASTER ISLAND	19A-1	131
GUAM	5A-1 to 5A-2	101
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HONOLULU	1A-1 to 1A-9	73
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PITCAIRN ISLAND	20A-1	132
PONAPE	7A-1	104
PUNTARENAS	14A-1	121
RABAUL	4A-1	100
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TALARA	12A-1	114
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TABLE 1A-1

R/V MAHI 1970 POSITIONAL DATA, HONOLULU, HAWAII  
AT PIER 18, STARBOARD SIDE TO DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)		
									CTRN	LATITUDE	LONGITUDE
56 1038	64	26			21 18 47.76N	157 52 1.06W	3	30	15	-0.5	0.3
56 1224	64	30			21 18 44.84N	157 52 2.04W	2	29	12	0.6	1.4
56 1520	63	36			21 18 50.46N	157 52 1.32W	2	31	5	2.2	-0.2
56 1646	54	25			21 18 47.56N	157 52 1.70W	2	29	14	1.3	-2.2
56 1706	63	26			21 18 47.06N	157 52 2.18W	2	26	14	0.6	0.6
56 1832	54	34			21 18 50.58N	157 52 3.35W	2	32	16	2.4	1.8
56 2024	42	61			21 18 47.40N	157 52 2.42W	2	29	7	-2.8	1.3
56 2226	64	22			21 18 46.14N	157 51 0.52W	2	26	9	0.9	-2.0
57 12	64	37			21 18 47.76N	157 52 2.08W	2	71	12	-0.5	0.6
* 57 248	63	14			21 18 47.06N	157 51 0.42W	2	10	9	0.1	-1.9
* 57 618	54	44			21 18 46.54N	157 52 2.16W	4	29	7	0.2	0.6
* 57 632	42	13			21 18 46.44N	157 52 2.47W	3	15	4	-2.8	2.8
* 57 1134	64	71			21 18 46.54N	157 52 2.47W	2	34	9	-1.2	2.7
* 57 1436	63	13			21 18 46.42N	157 52 0.66W	3	20	9	-2.4	-0.9
* 57 1620	63	60			21 18 46.04N	157 52 1.24W	2	31	0	-0.2	-0.3
* 57 1740	54	22			21 18 46.62N	157 51 0.32W	5	30	0	-1.6	-8.3
* 57 1930	42	46			21 18 47.84N	157 52 1.12W	2	28	7	-0.3	-0.2
* 57 2116	42	19			21 18 47.24N	157 52 2.02W	2	25	12	0.0	0.9
* 57 2322	64	67			21 18 47.44N	157 52 19.66W	2	14	0	12.6	-181.9
58 344	63	55			21 18 45.48N	157 52 0.48W	4	24	1	-2.7	-2.9
58 452	42	19			21 18 47.14N	157 52 1.52W	2	22	5	0.6	-0.3
* 58 716	53	10			21 18 52.04N	157 52 1.20W	4	14	6	3.0	-0.3
58 934	62	42			21 18 49.36N	157 52 2.04W	2	30	12	0.1	0.5
58 1044	64	42			21 18 47.22N	157 52 1.74W	2	34	16	-1.0	0.2
58 1234	64	20			21 18 46.44N	157 52 1.74W	2	25	10	0.3	0.2
58 1630	53	50			21 18 45.50N	157 52 2.04W	2	34	1	1.3	0.6
58 1650	54	13			21 18 47.76N	157 52 1.32W	2	32	15	-0.5	-0.3
58 1720	63	18			21 18 47.14N	157 52 2.02W	2	25	12	-1.1	1.3
58 2022	42	55			21 18 46.72N	157 52 1.02W	2	32	15	2.5	0.1
58 2236	64	33			21 18 47.80N	157 52 0.66W	2	28	8	1.6	-0.0
59 22	64	25			21 18 49.56N	157 52 2.02W	2	26	14	0.4	2.7
59 256	61	22			21 18 44.24N	157 52 1.02W	2	16	0	-0.7	-0.5
59 438	54	24			21 18 46.24N	157 52 0.24W	2	26	10	0.2	-1.4
59 442	54	13			21 18 46.36N	157 52 1.32W	2	26	9	0.4	-1.0
* 59 742	54	42			21 18 46.32N	157 52 1.32W	2	27	8	-1.6	-3.6
* 59 828	42	11			21 18 46.56N	157 52 0.66W	2	12	3	-2.6	4.5
59 1000	64	15			21 18 50.04N	157 51 0.64W	2	24	11	-1.9	-1.0
59 1144	64	53			21 18 47.94N	157 52 2.02W	2	35	17	-1.5	1.0
59 1444	63	13			21 18 48.78N	157 52 0.18W	2	27	12	0.6	-1.4
59 1628	63	47			21 18 47.34N	157 52 2.16W	2	35	3	-0.2	0.4
* 100 356	63	46			21 18 45.60N	157 51 29.46W	5	13	0	-3.2	-32.1
100 645	42	21			21 18 47.82N	157 52 0.14W	2	21	4	-0.4	-1.4
100 832	42	39			21 18 46.68N	157 52 4.50W	2	27	5	-2.1	3.0
100 1055	64	62			21 18 45.48N	157 52 1.08W	2	33	16	-2.7	-0.5

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-1

R/V MAHI 1970 POSITIONAL DATA, HONOLULU, HAWAII  
AT PIER 18, STARBOARD SIDE TO DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)		
									CTRN	LATITUDE	LONGITUDE
100 1244	64	12			21 18 49.52N	157 52 2.16W	2	20	9	1.4	0.6
100 1538	63	65			21 18 40.56N	157 52 0.64W	3	35	0	1.3	-0.9
100 1744	64	43			21 18 45.38N	157 52 0.64W	2	34	17	1.2	-1.0
100 1934	42	17			21 18 45.38N	157 52 2.52W	2	18	5	-1.8	1.0
100 2128	42	50			21 18 47.58N	157 52 1.66W	2	34	16	-0.5	0.3
101 1922	62	56			21 18 42.26N	157 52 0.42W	2	30	1	1.0	-1.1
* 101 2112	62	14			21 18 45.74N	157 52 2.04W	2	20	2	-2.6	0.6
101 2158	64	19			21 18 49.82N	157 51 58.50W	2	24	0	0.2	-3.2
101 2342	64	44			21 18 47.46N	157 52 2.42W	2	31	13	-0.8	0.7
102 44	63	66			21 18 46.80N	157 52 3.30W	2	19	1	-1.4	1.0
102 534	64	71			21 18 42.26N	157 52 3.70W	2	33	1	1.0	2.1
102 644	42	24			21 18 45.30N	157 51 56.44W	2	22	2	-2.9	-2.1
102 710	42	34			21 18 48.00N	157 52 1.74W	2	21	7	-0.2	2.2
* 102 1157	64	87			21 18 45.84N	157 51 38.74W	5	34	16	-2.4	-22.0
* 102 1456	63	60			21 18 49.30N	157 52 2.04W	4	12	6	1.2	0.5
* 102 1458	63	60			21 18 46.80N	157 52 2.20W	3	33	1	0.6	0.2
102 1656	54	57			21 18 46.78N	157 52 1.76W	2	34	17	0.6	0.2
* 102 1846	44	14			21 18 50.00N	157 52 2.04W	4	13	7	2.7	1.1
102 2014	62	45			21 18 47.14N	157 52 2.42W	2	34	17	-1.1	0.9
102 2274	64	70			21 18 40.16N	157 52 1.42W	2	32	0	0.1	-0.2
* 102 66	64	10			21 18 51.72N	157 52 0.40W	6	12	2	3.8	-0.7
102 712	61	46			21 18 47.54N	157 52 1.16W	2	26	6	-2.3	0.3
102 764	54	41			21 18 49.42N	157 52 0.64W	2	32	16	0.2	-0.9
* 103 712	64	15			21 18 40.76N	157 52 2.46W	2	26	12	1.6	0.9
* 103 716	62	76			21 18 45.76N	157 51 59.34W	2	34	12	-2.6	-2.2
103 1018	64	34			21 18 47.40N	157 52 0.72W	2	21	1	0.6	-0.8
103 1522	62	62			21 18 48.10N	157 52 0.76W	2	25	9	-2.0	-0.9
103 2152	62	12			21 18 44.34N	157 52 4.02W	3	19	2	-3.3	2.6
* 104 1555	62	56			21 18 46.48N	157 52 38.74W	2	23	0	-2.7	37.2
104 2244	64	59			21 18 49.80N	157 52 1.34W	2	16	0	0.3	-0.2
112 270	63	54			21 18 51.54N	157 51 56.22W	2	17	0	3.3	-4.7
112 410	64	45			21 18 49.60N	157 52 2.20W	2	23	2	0.4	0.7
* 112 448	63	9			21 18 46.80N	157 52 2.20W	2	29	4	-1.4	0.5
112 525	62	32			21 18 49.62N	157 52 1.00W	2	30	3	-1.5	-2.5
112 514	42	20			21 18 47.10N	157 52 6.24W	2	12	1	-1.1	4.7
112 1025	64	62			21 18 50.22N	157 52 0.00W	2	28	7	2.0	-1.5
* 112 1174	64	12			21 18 41.52N	157 51 56.88W	6	13	3	-5.7	-5.0
112 1446	63	54			21 18 49.42N	157 52 0.96W	2	31	0	0.2	-0.6
112 1454	64	23			21 18 50.34N	157 52 0.56W	2	26	11	2.1	-0.6
112 1718	64	39			21 18 50.04N	157 52 3.36W	2	31	14	1.8	1.8
112 1816	62	31			21 18 49.56N	157 52 1.38W	2	23	9	0.7	-0.2

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1B-1

ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 1B

NR	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
86	20	66	21 18 48.21N 157 52 1.53W	1.6 1.5	0.2 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS		DEVIATION >10 SECs OF ARC
			>5	>5	
97	242	X			
97	932	X			
97	1476	X			
97	1520			X	
97	2322			X	
98	716	X		X	
99	028	X			
100	356		X	X	X
100	1244	X			
101	2110	X			
102	1106		X	X	X
102	1549	X			
102	1942	X			
103	44	X		X	
103	734		X		
103	2108	X			
111	1908				
112	448	X			
112	1156	X		X	

TABLE 1C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 1B

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	20	21 16 47.53N 157 52 1.52W	1.0 1.8	0.2 0.4
54	14	21 16 47.48N 157 52 1.39W	1.1 1.7	0.3 0.4
63	14	21 16 47.48N 157 52 1.39W	1.1 1.7	0.3 0.4
64	18	21 18 47.50N 157 52 1.34W	1.0 1.5	0.2 0.4

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TABLE 1A-2  
R/V KANA KEOKI 1972 POSITIONAL DATA, HONOLULU, HAWAII  
MOORED PORT SIDE TO PIER 18 - SOUTH.

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DAY	GHT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)		
								CTS	CTS0	LATITUDE CONSTITUTE
306	52	63	11	N-E	21 18 26.44N	157 51 34.62W	3	10	1	-20.0 -26.4
306	114	65	15	N-W	21 18 47.50N	157 52 4.38W	2	23	2	-2.4 3.1
306	214	63	45	N-W	21 18 49.19N	157 52 0.66W	2	24	1	-0.2 -0.6
*306	2140	54	10	S-E	21 19 4.10N	157 52 25.69W	2	14	5	15.0 24.4
306	2244	65	21	N-E	21 18 45.00N	157 52 9.70W	3	15	3	-2.3 8.5
306	2324	54	33	S-W	21 18 40.32N	157 52 0.84W	2	20	0	0.9 -0.5
307	148	63	46	N-E	21 18 45.62N	157 52 1.20W	2	22	2	-1.0 -0.1
307	228	67	18	N-E	21 18 47.52N	157 52 1.10W	2	17	7	-2.0 2.1
307	ECB	64	31	N-W	21 18 47.50N	157 52 1.05W	2	25	14	-0.5 0.7
*307	544	6	8	N-E	21 18 45.54N	157 51 56.27W	3	4	1	-2.9 -5.1
*307	726	64	40	N-W	21 18 48.12N	157 51 54.31W	4	32	1	-2.3 -4.3
*307	81P	64	7	N-W	21 18 57.10N	157 51 56.20W	4	3	0	8.0 -3.1
*307	1136	65	77	S-W	21 19 51.05N	157 52 20.04W	5	24	1	2.6 13.4
*307	1454	65	7	S-W	21 19 52.92N	157 52 7.00W	6	6	0	-2.5 5.7
307	1454	63	30	S-E	21 19 56.94N	157 52 6.84W	5	24	14	2.5 -0.5
307	1562	64	18	S-E	21 19 46.04N	157 52 1.00W	2	28	11	0.7 0.7
307	2118	64	17	S-E	21 19 46.02N	157 52 1.32W	3	17	8	-0.4 0.0
307	2234	54	44	S-E	21 19 46.78N	157 52 1.10W	6	30	15	0.4 0.1
308	22	54	18	S-W	21 18 50.54N	157 52 2.60W	2	21	5	2.2 1.1
308	59	63	16	N-E	21 18 48.74N	157 51 57.14W	2	12	0	-1.7 -3.9
*308	124	65	9	N-E	21 18 48.36N	157 52 2.16W	2	11	1	-0.1 2.0
308	244	63	46	N-W	21 18 46.52N	157 52 1.20W	2	21	1	-1.1 -1.1
*308	830	42	25	N-E	21 18 50.22N	157 51 50.24W	4	12	15	-1.7 -1.7
308	1020	54	34	N-E	21 18 47.76N	157 52 0.56W	2	21	1	-2.4 -1.7
308	1236	54	21	N-E	21 18 49.62N	157 52 1.52W	2	20	14	-0.7 -0.6
308	1246	55	21	S-E	21 18 46.64N	157 52 1.50W	2	25	1	-2.2 -0.2
308	1406	63	74	S-E	21 18 48.42N	157 52 2.65W	2	25	12	-2.4 1.3
*308	1554	63	9	S-W	21 18 49.30N	157 52 3.06W	3	12	5	-0.1 1.0
308	1564	64	17	S-W	21 18 49.20N	157 51 5.45W	2	22	2	-0.5 -1.7
*308	1596	42	66	S-W	21 18 50.22N	157 51 34.00W	2	20	10	1.0 -24.4
308	2144	54	15	S-E	21 19 47.62N	157 52 1.04W	2	12	3	1.0 1.2
308	2248	65	30	N-E	21 18 49.54N	157 52 6.30W	2	30	5	0.1 -1.0
308	2328	54	52	S-W	21 18 49.22N	157 52 1.38W	2	34	15	0.9 0.1
309	36	65	28	N-W	21 19 47.72N	157 52 1.00W	2	28	14	-0.7 0.7
309	156	63	54	N-E	21 18 47.34N	157 52 0.72W	2	21	1	-2.5 -0.5
309	242	63	10	N-E	21 19 46.10N	157 52 3.70W	4	15	7	-1.7 2.7
*309	548	42	7	N-E	21 18 46.74N	157 51 52.48W	3	6	2	-12.1 -8.4
309	730	42	58	N-W	21 19 47.54N	157 51 54.49W	2	31	0	-0.8 -5.8
*309	522	42	7	N-W	21 19 47.02N	157 51 54.24W	4	9	2	18.7 -7.1
*309	936	54	11	N-E	21 19 50.52N	157 52 2.16W	3	9	1	2.1 0.9
*309	1014	42	11	S-E	21 19 49.74N	157 52 1.32W	4	15	2	2.4 0.0
309	1114	64	71	N-W	21 19 46.80N	157 52 1.50W	3	35	17	-1.6 0.2
309	1156	65	59	S-E	21 19 49.50N	157 52 1.62W	2	32	15	1.1 0.3
*309	1306	54	7	N-W	21 19 55.20N	157 52 7.86W	0	0	6	6.8 6.6

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-2  
R/V KANA KEOKI 1972 POSITIONAL DATA, HONOLULU, HAWAII  
MOORED PORT SIDE TO PIER 18 - SOUTH.

DAY	GHT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)		
								CTS	CTS0	LATITUDE CONSTITUTE
309	1220	63	32	S-E	21 19 49.30N	157 52 1.20W	2	24	0	1.4 -0.1
309	1504	63	29	S-W	21 19 50.34N	157 52 0.72W	2	27	0	1.3 -0.6
312	302	63	22	N-E	21 19 45.56N	157 52 1.64W	2	25	12	-1.0 0.7
312	236	42	16	N-E	21 19 47.74N	157 52 0.42W	2	27	12	-2.7 1.2
*312	264	64	77	N-E	21 19 44.11N	157 52 3.95W	3	34	1	-0.2 2.5
312	610	42	23	N-E	21 19 46.62N	157 52 1.32W	2	28	13	-1.7 0.0
*312	644	64	56	N-W	21 19 51.72N	157 52 1.74W	3	12	5	-6.8 0.4
*312	1022	64	57	N-E	21 19 47.24N	157 52 1.74W	2	35	17	-0.8 0.4
*312	1119	65	74	S-E	21 19 46.30N	157 51 50.76W	2	34	14	-0.6 -1.5
312	1214	54	15	N-W	21 19 45.86N	157 52 2.15W	2	23	11	-1.3 -0.6
312	1239	63	17	S-E	21 19 45.32N	157 52 0.04W	2	24	3	0.0 -0.3
312	1422	63	51	N-W	21 19 45.89N	157 52 1.04W	2	35	17	1.0 -1.2
*312	1754	42	14	S-E	21 19 48.04N	157 51 50.84W	2	10	5	-0.4 -1.4
312	1824	64	39	S-E	21 19 46.56N	157 52 1.32W	2	24	7	1.1 0.0
312	1940	42	56	S-W	21 19 50.10N	157 52 1.50W	2	30	14	1.7 0.2
312	2029	64	22	S-W	21 19 50.16N	157 52 1.09W	2	23	6	1.7 -0.2
312	2150	54	26	S-E	21 19 48.99N	157 52 1.62W	2	25	3	0.7 -0.3
312	2306	65	58	N-E	21 19 44.18N	157 52 1.09W	2	26	1	-0.2 -0.2
312	2336	54	30	S-W	21 19 49.62N	157 52 1.50W	2	29	4	1.2 -0.2
*313	30	63	12	N-E	21 19 47.34N	157 51 59.76W	4	11	4	-0.5 -1.5
*313	56	65	11	N-W	21 19 41.48N	157 52 1.38W	2	13	0	3.1 0.1
313	212	63	57	N-W	21 19 46.32N	157 52 1.20W	2	26	0	-2.1 -0.1

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1B-2  
ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 1B SOUTH

NP	N	NSD	LATITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
66	24	44	21 18 48.42N 157 52 1.30W	1.4 1.6	0.2 0.3

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ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ITERATIONS >75	DEVIATION >10 SECS OF ARC
306	52	X		X
306	2140	X		
307	54	X		
307	72		X	X
307	918	X	X	
307	1141		X	X
307	1326	X	X	
308	124	X		
308	810			
308	1554	X		
308	1240			X
309	312	X		
309	548	X		X
309	922	X		X
309	936	X		
309	1014	X		
309	1326	X		
312	65		X	
312	845	X		
312	1119		X	
312	1306	X		
312	1754	X		
313	30	X		
313	56	X		

TABLE 1C-2  
BY SATELLITE SET ---- ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 1B SOUTH

SATELLITE NUMBER	NSD	LATITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	21 18 48.25N 157 51 59.7W	1.4 3.1	0.5 1.3
54	12	21 18 48.59N 157 52 0.7W	1.3 2.1	0.4 0.5
63	13	21 18 48.45N 157 52 0.77W	1.4 2.0	0.4 0.5
64	4	21 18 47.79N 157 51 59.46W	1.0 3.4	0.5 1.7
65	8	21 18 48.75N 157 52 0.43W	1.3 2.5	0.5 0.9
67	2	21 18 48.36N 157 51 58.23W	1.1 5.3	0.9 3.4

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TABLE 1A-3  
P/V KANA KEOKI 1972 POSITIONAL DATA, HONOLULU, HAWAII  
MOORED PORT SIDE TO PIER 18, 38.4 METERS NORTH OF DAY 306 LOCATION.

DAY	GMT	SAT	ELEV	CFCM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)				
							IT	CTS	CTSO	LATITUDE	LONGITUDE
309	1650	42	42	S-E	21 18 52.16N	157 52 2.40W	2	30	14	0.2	1.6
309	203P	42	20	S-W	21 18 51.00N	157 52 1.32W	2	24	5	-1.1	0.4
*310	2206	65	10	N-E	21 18 47.12N	157 52 1.14W	4	9	3	-2.4	-5.4
310	2216	54	57	S-E	21 18 49.90N	157 52 2.40W	2	31	1	-0.1	1.5
310	2344	65	72	N-W	21 18 49.72N	157 52 1.20W	2	33	0	-1.2	0.3
*310	24	64	13	S-E	21 18 50.24N	157 52 2.82W	2	26	8	-1.0	1.9
310	1358	63	24	N-E	21 18 49.24N	157 52 0.54W	2	22	5	-1.0	-2.4
310	2522	63	32	N-E	21 18 50.04N	157 52 0.96W	2	27	1	0.1	0.1
310	1314	42	32	N-E	21 18 49.72N	157 52 0.56W	2	31	14	-1.0	-0.2
310	1344	64	64	N-E	21 18 49.60N	157 52 1.74W	2	16	11	-0.2	-1.1
310	1222	42	25	N-W	21 18 49.56N	157 52 1.20W	2	22	13	-1.4	-0.3
310	1242	64	44	N-E	21 18 49.56N	157 52 1.62W	2	12	2	-2.0	-1.2
310	1022	64	44	N-E	21 18 49.30N	157 52 1.62W	2	34	17	-1.4	-0.7
310	1126	65	51	S-E	21 18 50.40N	157 52 0.56W	2	32	15	-0.6	0.1
*310	1214	63	11	S-E	21 18 52.22N	157 52 1.62W	2	8	1	-17.6	16.1
310	1256	65	14	S-W	21 18 50.39N	157 52 1.74W	2	19	8	-2.5	2.4
*310	1414	63	45	S-W	21 18 49.30N	157 52 1.50W	2	30	0	-0.8	0.6
*310	1759	42	13	S-E	21 18 51.00N	157 52 2.70W	2	17	5	1.1	1.9
310	1914	64	26	S-E	21 18 51.48N	157 52 2.40W	2	25	4	1.6	1.5
310	1942	42	50	S-W	21 18 50.52N	157 52 0.84W	2	33	11	0.5	-0.1
310	2148	54	20	S-E	21 18 51.12N	157 52 1.22W	2	23	9	1.2	0.4
310	2256	65	44	N-E	21 18 50.82N	157 52 0.66W	2	16	3	0.9	-0.8
310	2332	54	40	S-W	21 18 51.48N	157 52 0.56W	2	30	15	0.7	-0.6

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1B-3  
ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 18, 38.4 METERS NORTH.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
37	8	29	21 18 49.82N 157 52 0.50W	1.3 1.3	0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS <15 >75	DEVIATION >5 >10 SEC'S OF ARC
309	2206	X		
310	24	X		
310	1234	X	X	X
310	1256	X		
310	1758	X		
311	544	X		
311	726	X	X	
311	918	X	X	

TABLE 1C-3  
BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 18, 38.4 METERS NORTH.

SATELLITE	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	21 18 49.84N 157 52 1.26W	1.0 0.7	0.5
54	6	21 18 49.83N 157 52 1.45W	0.9 0.8	0.4
63	6	21 18 49.83N 157 52 1.45W	0.9 0.8	0.3
64	6	21 18 49.83N 157 52 1.45W	0.9 0.8	0.4
65	6	21 18 49.83N 157 52 1.45W	0.9 0.8	0.3

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TABLE 1A-4

R/V KANA KEOKI 1972 POSITIONAL DATA, HONOLULU, HAWAII

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DAY	GMT	SAT	ELEV	CEGM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
311	1946	42	46	S-E	21 18 27.66N	157 51 58.56W	2	28	1	-0.2	-0.4
*311	1910	64	81	S-W	21 18 24.04N	157 51 58.36W	4	28	0	0.3	-4.6
311	2016	42	18	S-W	21 18 24.62N	157 51 58.06W	3	16	0	0.8	-0.0
*311	2058	64	7	S-W	21 18 13.44N	157 51 52.82W	5	0	0	-13.9	3.8
311	2210	65	16	N-E	21 18 27.60N	157 51 57.99W	2	23	11	-0.2	-1.1
311	2240	64	46	S-E	21 18 24.26N	157 51 56.66W	2	27	0	0.4	1.7
311	2354	65	48	N-W	21 18 26.34N	157 51 58.66W	2	32	0	-0.9	-0.1
312	28	54	9	S-W	21 18 27.66N	157 51 58.56W	2	10	0	-0.8	-0.3

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1B-4

ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 10.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
8	3	5	21 18 27.82N 157 51 58.99W	0.6 1.0	0.3 0.8

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS <15	>15	DEVIATION >5	>10 SECS OF ARC
311	1910			X		
311	2058	X		X		
312	28	X				X

TABLE 1C-4

BY SATELLITE -- ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 10.

SATELLITE	NGO	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	21 18 28.14N 157 51 58.77W	0.7 0.3	0.5 0.2
54	1	21 18 27.66N 157 51 58.56W		
65	2	21 18 28.14N 157 51 58.77W	0.7 0.3	0.5 0.2

TABLE 1A-5

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PCAT E10 TO PIER 10.

DAY	GMT	SAT	ELEV	CEGM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
204	2018	65	8	S-W	21 19 51.18N	157 52 7.20W	3	8	3	2.8	5.7
204	2210	63	15	S-W	21 18 49.28N	157 52 1.32W	2	24	5	1.6	-0.2
205	14	64	18	S-E	21 18 40.72N	157 51 56.68W	2	13	0	0.4	-7.9
205	158	64	46	S-W	21 18 42.65N	157 52 1.32W	2	32	8	1.5	-0.2
205	256	42	17	S-W	21 19 50.24N	157 52 0.65W	2	23	3	1.7	-0.8
205	414	54	63	S-E	21 18 48.42N	157 52 0.32W	2	17	1	0.1	-0.2
*205	558	54	12	S-W	21 18 47.94N	157 52 2.52W	2	18	9	-0.4	1.0
205	610	65	65	S-E	21 18 48.36N	157 52 2.70W	2	33	16	0.0	1.2
*205	610	65	10	N-W	21 18 40.66N	157 52 3.05W	2	14	6	0.3	1.6
205	1606	63	21	N-W	21 18 47.44N	157 52 1.74W	2	26	12	-0.9	0.3
*205	1202	64	14	N-W	21 18 50.59N	157 52 0.54W	3	11	1	2.2	-0.9
205	1244	64	55	N-W	21 18 47.64N	157 52 0.16W	2	34	3	-0.7	-0.8
205	1246	42	22	N-W	21 18 47.72N	157 52 1.30W	2	27	13	-0.6	-0.1
205	1446	54	46	N-W	21 18 47.52N	157 52 0.24W	2	22	7	-0.1	-0.6
205	1742	45	30	S-E	21 18 47.52N	157 51 58.52W	2	24	5	-0.6	-2.0
205	1928	65	27	S-W	21 18 49.80N	157 52 2.70W	2	23	14	1.6	1.2
205	2122	63	45	S-W	21 18 51.07N	157 52 1.45W	2	30	2	2.7	0.0
206	110	64	60	S-E	21 18 43.26N	157 52 4.38W	3	13	16	0.9	2.9
*206	258	64	11	S-W	21 18 53.15N	157 52 4.02W	2	17	8	4.9	2.5
206	326	64	22	S-E	21 18 49.64N	157 52 1.32W	2	25	11	1.1	-0.5
206	506	64	35	S-W	21 18 49.74N	157 52 0.65W	2	20	8	1.4	-0.5
206	532	65	24	N-E	21 18 49.50N	157 52 2.64W	2	29	13	1.2	-1.2
206	720	65	31	N-W	21 18 47.64N	157 52 1.32W	2	24	12	-0.7	-2.1
206	929	63	59	N-W	21 18 45.74N	157 52 0.32W	2	31	12	-1.6	-1.2
206	1254	64	54	N-E	21 18 48.06N	157 52 2.62W	2	31	1	-0.3	1.0
206	1444	42	43	N-W	21 18 49.00N	157 51 55.52W	2	16	0	-0.3	-2.0
206	1508	64	17	N-E	21 18 47.34N	157 52 0.30W	2	24	11	-1.0	-1.2
206	1652	64	49	N-W	21 18 46.50N	157 52 1.20W	2	35	17	-1.8	-0.3
206	1840	65	51	S-W	21 18 45.90N	157 52 5.04W	2	26	0	-2.4	3.6
206	2032	63	66	S-E	21 18 47.04N	157 52 2.20W	2	19	6	-1.3	0.8
*206	2220	63	12	S-W	21 18 44.28N	157 52 1.20W	4	19	8	-4.1	-0.3
207	22	64	26	S-E	21 18 47.52N	157 52 2.70W	2	26	4	-0.9	1.2
207	206	42	53	S-E	21 18 46.30N	157 52 1.98W	2	19	1	-0.0	0.5

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 1A-5  
ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 1A.

NR	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
33	6	27	21 18 48.34N 157 52 1.48W	1.3 1.4	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION >10 SECS OF AFC
204	2018	X		
205	558	X		
205	810	X		
205	1202	X		
206	258	X		
206	2220	X		

TABLE 1C-5

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 1A.

SATELLITE	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	4	21 18 48.51N 157 52 0.89W	1.0 1.1	0.5
54	6	21 18 48.33N 157 52 0.49W	0.9 0.8	0.4 0.3
63	5	21 18 48.49N 157 52 0.97W	0.9 0.9	0.4 0.4
64	6	21 18 48.33N 157 52 0.95W	0.9 0.8	0.4 0.3
65	7	21 18 48.52N 157 52 1.00W	1.0 0.8	0.4 0.3

TABLE 1A-6

R/V KANA KEDIKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
PORT SIDE TO PIER 1A, ANTENNA 20.7 METERS NORTH OF S. END OF PIER.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CT50	DEVIATION FROM THE MEAN (IN SECONDS OF AFC)	
										LATITUDE	LONGITUDE
262	1646	42	26	N-E	21 18 48.50N	157 52 0.50W	2	25	8	-1.7	-3.8
262	1202	64	8	N-W	21 18 48.20N	157 52 0.57W	2	32	4	6.2	-3.4
262	230	42	29	N-E	21 18 47.20N	157 52 2.00W	2	28	14	-1.3	0.3
262	1320	54	61	N-E	21 18 47.10N	157 52 2.00W	2	32	15	-1.1	0.4
262	1422	65	22	S-E	21 18 48.34N	157 52 2.62W	2	31	14	-1.5	0.8
262	1428	65	44	S-E	21 18 48.02N	157 52 2.62W	2	37	18	-1.2	0.5
262	1720	63	60	S-E	21 18 48.26N	157 52 3.72W	2	27	9	-0.3	2.0
262	1519	73	17	S-W	21 18 48.14N	157 52 1.74W	2	13	3	-0.4	2.0
262	2136	64	39	S-E	21 18 48.54N	157 52 1.62W	2	30	3	-0.2	0.1
262	2204	42	10	S-E	21 18 48.76N	157 52 1.77W	2	9	7	2.1	-3.0
262	2322	64	21	S-W	21 18 48.56N	157 52 1.38W	2	25	10	-0.3	-0.3
262	2350	42	45	S-E	21 18 48.24N	157 52 0.48W	2	30	0	-0.5	-0.2
262	1112	54	69	S-W	21 18 47.80N	157 52 1.34W	12	0	0	-0.8	-1.3
262	302	54	7	S-E	21 18 23.24N	157 52 4.02W	3	0	0	-15.5	2.3
262	256	65	51	N-W	21 18 47.34N	157 52 2.82W	2	28	1	-1.4	1.1
262	516	63	50	N-E	21 18 48.48N	157 52 1.50W	2	33	2	-0.2	-0.2
262	706	63	19	N-W	21 18 47.40N	157 52 1.50W	2	21	1	-1.3	0.2
262	924	64	31	N-E	21 18 48.39N	157 52 1.62W	2	26	1	0.7	-0.1
262	954	42	7	N-W	21 18 48.24N	157 52 4.02W	2	4	5	-5.5	2.4
262	1112	64	27	N-W	21 18 48.24N	157 52 2.64W	2	29	18	-0.5	0.0
262	1139	42	75	N-W	21 18 46.00N	157 52 24.48W	2	24	1	-2.6	22.9
262	1258	54	45	N-E	21 18 48.72N	157 52 3.30W	2	33	0	0.5	1.8
262	1226	42	7	N-W	21 18 48.12N	157 52 3.26W	2	0	0	20.4	-0.4
262	1448	54	9	N-W	21 18 50.82N	157 52 1.86W	2	11	0	2.1	-0.2
262	1520	65	71	S-E	21 18 48.72N	157 52 3.84W	2	25	0	0.0	2.1
262	1522	63	22	S-E	21 18 48.91N	157 52 1.86W	2	27	12	0.7	0.2
262	1704	45	11	S-E	21 18 48.54N	157 52 2.16W	2	19	8	-1.1	2.5
262	1628	63	36	S-E	21 18 48.22N	157 52 1.74W	2	31	15	-0.5	0.0
262	2046	64	14	S-E	21 18 48.00N	157 52 1.20W	2	13	0	-3.7	-0.2
263	20	54	35	S-E	21 18 48.60N	157 52 2.40W	2	28	3	-0.1	0.7
263	42	42	20	S-E	21 18 52.02N	157 52 1.33W	2	18	5	3.3	-0.3
263	268	54	24	S-E	21 18 51.42N	157 52 4.02W	2	27	0	2.7	3.2
263	306	65	62	N-E	21 18 49.15N	157 52 6.65W	2	34	17	-0.5	-1.0
263	430	63	19	N-E	21 18 48.72N	157 52 2.62W	2	24	6	0.0	-0.0
263	456	65	12	N-W	21 18 45.35N	157 52 2.16W	2	16	2	-3.3	0.5
263	616	63	47	N-W	21 18 47.29N	157 52 1.86W	2	34	16	-1.4	0.2
263	838	64	10	N-E	21 18 51.60N	157 52 1.03W	2	12	4	2.0	-0.6
263	1020	64	69	N-E	21 18 47.24N	157 52 0.06W	2	33	0	-0.5	-1.6
263	1240	42	31	N-E	21 18 47.94N	157 52 0.30W	2	31	14	-0.8	-1.4
263	1228	54	23	N-E	21 18 48.00N	157 52 0.74W	2	13	0	0.2	-1.0
263	1228	42	27	N-W	21 18 47.64N	157 52 2.16W	2	29	14	-1.1	0.6
263	1254	54	31	N-W	21 18 47.64N	157 52 1.32W	2	30	14	-1.1	-0.4
263	1432	65	32	S-E	21 18 50.15N	157 52 2.64W	2	33	15	1.5	0.0
263	1618	65	21	S-E	21 18 49.98N	157 52 0.54W	2	34	16	1.3	-1.2
263	1738	63	68	S-E	21 18 48.96N	157 52 11.94W	2	29	0	0.3	10.2

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 1A-6

ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 18, ANT. 20.7 METERS NORTH.

NP	N	NSC	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
			LONGITUDE	(SECONDS)	(SECONDS)
45	14	31	21 18 48.70N	1.2	0.2
			157 52 1.70W	1.4	0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELATITUD	ITERATIONS	DEVIATION
		K15 >75	>25	>10 SEC'S OF ARC
251	1202	X		
251	1218	X		
251	2206	X		
252	112		X	
252	102	X	X	X
252	04	X	X	X
252	1138			
252	1208	X		
252	1448	X		
252	1708	X		
252	2048	X		
253	456	X		
253	838	X	X	X
253	1738			

TABLE 1A-6

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 18, ANT. 20.7 METERS NORTH.

SATELLITE NUMBER	NSC	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
		LONGITUDE	(SECONDS)	(SECONDS)
42	6	21 18 48.36N	1.8	0.8
		157 52 0.77W	1.6	0.6
54	6	21 18 48.36N	1.8	0.9
		157 52 0.77W	1.6	0.6
63	7	21 18 48.25N	1.7	0.5
		157 52 0.85W	1.5	0.5
64	5	21 18 48.50N	2.0	0.9
		157 52 0.49W	1.6	0.7
65	7	21 18 48.25N	1.7	0.6
		157 52 0.85W	1.5	0.3

TABLE 1A-7

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
PORT SIDE TO PIER 18, ANTENNA 11.6 METERS NORTH OF S. END OF PIER.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)			
								CTS	CTS0	LATITUDE	LONGITUDE
290	144	65	46	N-E	21 18 46.68N	157 52 0.70W	2	36	17	-1.5	-1.3
290	244	63	39	N-E	21 18 46.72N	157 52 0.18W	2	14	1	0.5	-1.4
290	426	63	20	N-E	21 18 47.09N	157 52 0.18W	2	19	2	0.9	-1.4
290	700	64	39	N-E	21 18 48.60N	157 52 2.04W	2	31	1	0.4	0.5
290	840	42	49	N-E	21 18 47.52N	157 52 1.74W	2	34	16	-2.6	0.2
290	1226	42	16	N-W	21 18 47.92N	157 52 2.16W	2	23	10	-0.3	0.5
290	1208	65	75	S-W	21 18 47.28N	157 51 58.20W	2	32	1	-0.9	-1.4
290	1404	63	18	S-E	21 18 47.04N	157 51 58.20W	2	18	1	-1.1	-1.3
290	1549	63	44	S-W	21 18 47.74N	157 51 59.10W	2	28	4	1.5	-2.5
290	1824	64	19	S-E	21 18 47.34N	157 52 2.04W	2	25	9	1.2	0.5
290	2002	42	21	S-E	21 18 48.50N	157 52 2.40W	2	22	5	1.3	0.6
290	2146	42	38	S-W	21 18 49.92N	157 51 54.72W	3	16	0	0.7	-6.8
*290	2214	65	6	N-E	21 18 51.72N	157 51 58.44W	6	9	2	3.6	-3.1
290	2346	54	16	S-W	21 18 50.16N	157 52 1.00W	2	23	11	2.0	-0.4
*291	54	65	71	N-E	21 18 59.46N	157 49 58.00W	3	31	0	11.3	-126.5
*291	244	65	54	N-W	21 18 48.54N	157 52 0.06W	2	0	0	0.4	-1.6
*291	340	63	54	N-E	21 18 47.62N	157 52 4.25W	2	26	4	-1.5	2.6
*291	612	44	16	N-E	21 18 45.72N	157 52 1.20W	2	21	19	-2.4	-6.4
*291	748	42	16	N-E	21 18 47.04N	157 51 58.74W	2	22	19	-0.3	-2.8
*291	804	64	55	N-W	21 18 46.74N	157 52 2.15W	2	17	19	-1.4	-0.8
*291	822	62	50	N-W	21 18 46.24N	157 52 2.62W	2	22	14	-0.5	-1.0
*291	957	54	39	N-E	21 18 46.24N	157 52 3.54W	2	22	12	-1.7	0.5
*291	1122	54	33	S-E	21 18 46.64N	157 52 4.04W	2	31	14	-0.1	1.1
*291	1240	65	33	S-E	21 18 49.64N	157 52 4.70W	2	23	10	0.0	-0.2
*291	156	63	49	S-E	21 18 49.18N	157 52 1.33W	2	26	0	0.4	-0.2
*291	1522	63	64	S-E	21 18 49.40N	157 52 1.74W	3	26	10	0.4	-0.2
*291	154	63	14	N-E	21 18 24.72N	157 52 0.18W	2	20	0	-2.4	-1.4
*291	1926	42	71	S-E	21 18 49.74N	157 52 1.14W	2	31	0	8.6	1.6
*291	2252	42	67	S-E	21 18 49.14N	157 52 1.63W	2	23	0	1.0	4.6
*291	1646	63	12	S-W	21 18 21.69N	157 51 58.02W	4	25	1	-16.5	-9.4
*291	2240	42	17	S-W	21 18 50.04N	157 52 1.65W	6	15	7	2.4	-0.1
*291	2246	54	45	S-W	21 18 49.38N	157 52 1.74W	2	26	11	1.2	0.2
292	6	65	37	N-E	21 18 47.16N	157 52 1.65W	2	30	3	-1.0	0.3
292	174	65	27	N-W	21 18 47.64N	157 52 0.66W	2	32	5	-0.5	-0.6
292	246	73	57	N-E	21 18 45.42N	157 52 3.14W	3	17	1	0.3	1.6
*292	436	63	13	N-W	21 18 40.09N	157 52 9.30W	3	11	1	-8.1	7.7
292	700	64	56	N-E	21 18 47.82N	157 52 2.52W	2	29	0	-0.3	1.0
292	836	42	54	N-E	21 18 47.46N	157 52 1.86W	2	33	15	-0.7	0.7
*292	1024	42	14	N-W	21 18 47.16N	157 52 2.16W	2	21	0	-1.0	0.6
292	1042	54	59	N-W	21 18 46.58N	157 52 1.42W	2	30	14	-1.2	0.1
*292	1134	65	13	S-E	21 18 49.02N	157 52 2.70W	2	19	4	0.3	1.1
292	1218	65	50	S-W	21 18 48.36N	157 52 0.06W	2	32	15	0.2	-1.5
292	1414	63	26	S-E	21 18 47.46N	157 52 0.84W	2	14	0	-0.7	-0.7
292	1558	63	31	S-W	21 18 50.34N	157 52 1.09W	2	25	2	2.2	2.4
292	1822	64	28	S-E	21 18 47.14N	157 52 2.64W	2	26	5	1.0	1.1
292	1556	42	23	S-E	21 18 48.36N	157 52 2.82W	2	19	0	0.2	0.7

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE IA-7 (CONT.)  
F/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
PCRT SIDE TO PIER 18, ANTENNA 14.6 METERS NORTH OF S. END OF PIER.

DAY	GMT	SAT	ELEV	GFOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)				
							IT	CTS	CTSQ	LATITUDE	LONGITUDE
252	2015	64	31	S-E	21 18 49.62N	157 52 1.32W	2	19	2	1.4	-0.2
252	2142	42	34	S-W	21 18 49.62N	157 52 0.84W	2	32	15	1.5	-0.7
252	2202	54	65	S-E	21 18 49.14N	157 52 1.92W	3	24	0	1.0	0.6
*252	2250	54	11	S-W	21 18 46.62N	157 52 6.35W	4	15	1	-1.5	4.9
*253	202	63	21	N-E	21 18 56.16N	157 52 31.39W	2	24	12	0.0	80.5
253	246	63	38	N-W	21 18 45.66N	157 52 1.85W	2	19	1	-2.5	0.3
*253	620	64	22	N-E	21 19 1.52N	157 52 1.54E	2	27	13	13.8	-7.0
253	744	42	17	N-E	21 19 48.01N	157 52 0.42W	2	20	1	0.4	-1.1
253	836	39	39	N-W	21 19 46.20N	157 52 0.56W	2	32	13	-2.0	-0.5
253	930	42	46	N-W	21 19 46.72N	157 52 1.74W	2	26	11	-1.5	0.2
253	948	54	51	N-E	21 19 47.20N	157 52 2.24W	2	35	17	-0.6	0.7
253	1136	54	16	N-W	21 19 46.38N	157 52 2.15W	2	23	11	-1.9	0.6
253	1230	65	59	S-E	21 18 49.22N	157 52 4.02W	2	31	14	0.0	2.5
*253	1234	63	8	S-E	21 18 48.72N	157 52 6.98W	4	5	1	0.5	7.1
*253	1414	65	11	S-W	21 18 49.13N	157 52 1.66W	3	15	1	2.3	0.1
*253	1559	63	82	S-E	21 18 49.13N	157 52 5.04W	6	30	2	0.2	7.5
*253	1930	64	79	S-E	21 18 49.01N	157 52 0.33W	2	33	1	0.1	-1.1
253	2044	42	54	S-E	21 18 49.26N	157 52 1.00W	2	26	0	1.1	0.4
*253	2052	52	25	S-E	21 18 49.26N	157 52 2.04W	2	18	3	1.7	2.3
*253	2124	42	9	S-E	21 18 43.26N	157 52 3.20W	7	12	5	-4.9	1.7
253	2254	54	34	S-E	21 18 50.32N	157 52 1.80W	2	30	1	2.2	-0.1
254	16	65	53	N-E	21 18 49.24N	157 52 3.30W	2	34	13	0.1	1.7
254	216	65	19	S-W	21 18 45.42N	157 52 2.04W	2	28	13	-2.7	1.5
*254	256	63	79	N-E	21 18 49.00N	157 52 1.20W	5	27	6	0.7	-0.4
*254	448	63	6	N-E	21 23 6.66N	157 48 4.32W	8	6	0	85.8	-237.2
254	718	64	73	N-E	21 18 47.64N	157 52 6.54W	4	32	1	-0.5	5.0
254	832	42	59	N-E	21 18 47.20N	157 52 1.86W	2	32	15	-0.6	0.3
254	855	42	18	N-E	21 18 45.56N	157 51 5.25W	2	25	11	-1.6	-2.2
254	1020	42	15	N-E	21 18 45.00N	157 51 2.70W	2	18	1	-3.2	1.1
254	1044	54	45	N-W	21 18 45.74N	157 52 1.56W	2	22	0	-1.8	0.3
254	1142	65	21	S-E	21 18 49.22N	157 52 1.62W	2	25	11	0.0	0.1
254	1228	65	33	S-W	21 18 49.22N	157 52 0.00W	2	29	13	1.5	-1.5
254	1420	53	38	S-E	21 18 47.16N	157 52 1.32W	2	14	0	-1.0	-0.2
254	1676	63	22	S-W	21 18 51.00N	157 51 54.60W	2	24	7	2.8	-7.0
254	1842	64	40	S-E	21 18 49.00N	157 52 1.33W	2	30	7	0.9	-0.2
254	1952	42	25	S-E	21 18 49.32N	157 52 0.54W	2	27	3	1.2	-1.0
*254	2022	54	7	S-E	21 18 51.38N	157 51 85.4W	14	0	0	-15.8	-15.8
254	2138	42	33	S-W	21 18 50.10N	157 52 1.62W	2	31	15	1.9	0.1
*254	2206	44	73	S-E	21 18 49.14N	157 52 15.42W	9	30	0	1.0	13.2
254	2230	65	21	N-E	21 18 45.56N	157 52 2.04W	2	28	11	-2.5	0.6
*254	2354	54	7	S-E	21 18 45.92N	157 52 4.26W	2	7	3	-2.3	2.7
255	114	65	47	N-W	21 18 46.50N	157 52 0.00W	2	36	17	-1.7	-1.6
255	208	63	30	N-E	21 18 47.28N	157 52 1.62W	2	19	3	-0.9	0.4
255	556	61	26	N-E	21 18 52.52N	157 52 1.62W	2	13	1	4.8	0.1
255	530	64	32	N-F	21 18 47.58N	157 52 1.32W	2	30	14	-0.6	-0.2
255	738	42	19	N-F	21 18 46.92N	157 52 0.84W	2	24	4	-1.2	-0.7

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN  
TABLE IA-7 (CONT.)  
F/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
PCRT SIDE TO PIER 18, ANTENNA 14.6 METERS NORTH OF S. END OF PIER.

DAY	GMT	SAT	ELEV	GFOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)				
							IT	CTS	CTSQ	LATITUDE	LONGITUDE
265	616	64	24	N-W	21 18 46.70N	157 52 1.32W	2	28	14	-1.4	-0.2
265	922	42	42	N-W	21 18 46.74N	157 52 0.94W	2	33	16	-1.4	-0.6
265	922	54	56	N-E	21 18 48.24N	157 52 2.04W	2	34	0	0.1	-1.4
*265	1140	54	11	N-E	21 18 46.24N	157 52 3.18W	3	17	7	-1.7	1.6
265	1200	54	79	S-E	21 18 46.00N	157 52 2.04W	3	30	1	1.0	21.2
*265	1314	53	13	S-E	21 18 57.20N	157 52 1.50W	3	30	2	9.4	11.0
*265	1429	65	7	S-W	21 18 47.00N	157 52 1.78W	2	0	0	-10.7	5.2
265	1518	43	58	S-W	21 18 49.62N	157 52 4.48W	2	22	4	1.5	1.0
265	1754	64	15	S-E	21 18 51.35N	157 52 0.44W	2	18	4	3.2	2.5
265	1739	64	54	S-W	21 18 46.00N	157 52 6.44W	2	33	0	0.7	-3.7
*265	2044	42	57	S-F	21 18 46.14N	157 52 6.29W	3	29	6	1.0	3.7
*266	544	64	11	N-E	21 18 51.48N	157 52 1.30W	3	16	7	3.3	-0.2
266	728	64	64	N-W	21 18 47.42N	157 52 1.38W	2	27	1	-0.8	0.4
266	828	42	61	N-E	21 18 47.46N	157 52 1.32W	2	27	0	-0.7	-0.2
266	904	54	24	N-E	21 18 47.10N	157 52 0.18W	2	24	1	-1.1	-1.4
*266	1015	42	11	N-W	21 18 44.44N	157 52 1.39W	6	17	9	-1.0	-0.2
266	1049	54	35	N-W	21 18 46.64N	157 52 2.16W	2	33	16	-1.5	0.6
266	1152	65	75	S-E	21 18 48.56N	157 52 2.64W	2	29	13	0.0	1.1
266	1338	65	22	S-E	21 18 49.72N	157 52 1.29W	2	25	11	0.0	-0.5
266	1428	63	46	S-E	21 18 49.62N	157 52 3.72W	2	12	0	0.6	2.2
266	1850	64	59	S-E	21 18 49.26N	157 52 2.64W	3	27	0	1.1	1.1
266	1950	42	29	S-E	21 18 49.50N	157 52 5.74W	3	14	3	-1.3	4.2
*266	2226	54	10	S-E	21 18 45.00N	157 51 57.34W	3	12	2	-3.2	-4.0
*266	2112	64	14	S-W	21 18 47.04N	157 52 0.00W	3	14	4	-1.1	-1.6
*266	2132	64	30	S-E	21 18 49.32N	157 52 2.54W	2	29	14	1.2	-1.1
*266	2210	64	53	S-W	21 18 47.76N	157 51 58.85W	2	20	0	-0.4	-6.1
*266	2340	42	11	S-E	21 18 45.44N	157 52 6.48W	2	27	2	-1.7	-2.6
*266	2400	54	7	S-W	21 18 21.54N	157 52 6.48W	6	0	6	-26.4	4.0
267	126	65	33	N-W	21 18 46.18N	157 52 0.18W	2	30	0	-1.9	-1.4
267	220	63	43	N-E	21 18 49.20N	157 52 2.24W	2	18	2	0.7	0.2
267	404	64	18	N-W	21 18 46.52N	157 52 1.19W	2	24	11	-1.2	-0.2
267	639	54	44	N-E	21 18 47.10N	157 52 1.20W	2	29	12	-1.1	-0.4
*267	736	42	21	N-E	21 18 47.16N	157 52 0.50W	2	26	12	-1.0	-0.8
*267	814	54	7	N-E	21 18 47.24N	157 52 5.54W	2	20	0	3.0	-2.6
267	826	64	18	N-W	21 18 45.44N	157 52 2.04W	2	21	4	-1.7	0.5
267	920	42	76	N-W	21 18 45.56N	157 52 2.04W	2	33	14	-1.2	0.5
*267	956	54	78	N-E	21 18 47.28N	157 52 2.70W	2	34	1	-2.9	1.1
*267	1105	65	10	S-F	21 18 47.10N	157 52 1.86W	2	13	5	-1.1	0.3
*267	1146	54	7	N-W	21 18 51.60N	157 51 55.34W	6	3	3	3.4	-2.2
267	1250	65	62	S-W	21 18 49.44N	157 51 50.10W	2	31	15	0.3	-2.5
267	1340	63	20	S-E	21 18 51.84N	157 52 4.02W	4	20	5	2.7	2.5
267	1526	63	41	S-W	21 18 50.52N	157 52 1.32W	2	23	1	2.4	-0.2
267	1832	64	22	S-E	21 18 49.38N	157 52 2.16W	2	26	7	1.2	-0.6
267	1948	64	34	S-W	21 18 49.62N						

TABLE 1B-7

ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 18, ANT. 14.6 METERS NORTH.

NP	N	NSC	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
			LONGITUDE	(SECONDS)	(SECONDS)
138	37	101	21 18 48.17N 157 52 1.56W	1.6 1.9	0.1 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>10 SECs OF ARC
290	2314	X	X	
291	54			X
291	244	X	X	
291	612	X		
291	154	X		X
291	1648	X		X
291	2240		X	
292	435	X		
292	1024	X		
292	1134	X		
292	2350	X		
293	202			X
293	620			
293	1324	X		
293	1418	X		
293	1508		X	X
293	1910			
293	2234	X	X	
294	2056		X	X
294	448	X		X
294	2022	X		X
294	2205		X	
294	2354	X		
295	1140	X		
295	1240		X	
295	1334	X		
295	1428	X		X
295	544	X		
296	1016	X		X
296	2025	X		
296	2042	X		
296	2400	X		X
297	814	X		
297	956		X	
297	1106	X		
297	1145	X		X
297	2040	X	X	

TABLE 1C-7

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 18, ANT. 14.6 METERS NORTH.

SATELLITE NUMBER	NSD	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
		LONGITUDE	(SECONDS)	(SECONDS)
42	25	21 18 48.00N 157 52 1.74W	1.2 2.6	0.2 0.5
54	17	21 18 48.22N 157 52 1.28W	1.3 2.2	0.7 0.5
63	20	21 18 48.17N 157 52 1.44W	1.3 2.2	0.3 0.5
64	20	21 18 48.13N 157 52 1.44W	1.3 2.2	0.3 0.5
65	19	21 18 48.08N 157 52 1.24W	1.3 2.1	0.3 0.5

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TABLE 1A-8

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	GCRN	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
253	250	64	50	N-E	21 18 47.70N	157 52 1.40W	3	35	16	-1.4	2.0
354	140	42	26	N-E	21 18 47.70N	157 52 1.40W	2	20	7	-0.4	0.1
354	436	64	13	N-E	21 18 46.58N	157 52 1.40W	3	16	4	-1.5	-0.4
354	542	42	34	N-E	21 18 46.58N	157 52 1.40W	2	32	15	-1.6	0.6
354	520	63	61	N-E	21 18 46.58N	157 52 1.40W	2	34	0	-1.2	-0.2
354	612	64	7	N-E	21 18 46.32N	157 52 1.40W	4	0	0	-1.8	1.9
354	632	65	52	S-E	21 18 46.90N	157 52 2.64E	2	33	15	0.7	1.2
354	1018	65	16	S-E	21 18 49.32N	157 52 1.30W	2	26	12	1.1	-0.1
354	1038	63	38	S-E	21 18 49.92N	157 52 1.42W	5	14	1	-1.7	2.8
354	1116	66	43	S-E	21 18 49.78N	157 52 2.14W	2	35	16	-2.4	2.7
354	1216	63	21	S-E	21 18 49.52N	157 52 1.40W	2	27	12	-1.7	-0.4
354	1202	66	21	N-E	21 18 44.16N	157 52 1.62E	2	29	13	-4.0	0.1
354	1514	64	80	S-E	21 18 48.54N	157 52 2.04W	3	29	0	0.3	2.6
354	1702	64	8	S-E	21 18 45.67N	157 52 4.68E	2	0	0	-3.1	3.2
354	1718	64	77	S-E	21 18 48.24N	157 52 5.64W	3	0	0	0.0	-2.4
354	1742	54	50	S-E	21 19 49.44N	157 52 1.58W	2	24	0	1.2	0.5
354	1900	42	7	S-E	21 18 35.40N	157 52 4.00W	3	0	0	-12.9	7.5
354	1930	54	11	S-E	21 18 51.12N	157 52 2.24W	2	15	3	-2.9	0.8
354	2220	45	42	N-E	21 18 47.10N	157 52 1.50W	2	28	2	-1.1	0.0
354	2228	65	15	N-E	21 18 44.52N	157 52 1.62E	2	21	16	-3.7	2.1
354	2234	66	12	S-E	21 18 46.70N	157 52 0.10W	2	14	5	-1.4	-1.3
354	6	63	26	N-E	21 18 47.64N	157 52 2.04W	2	28	3	-0.6	1.5
354	322	64	45	N-E	21 18 47.72N	157 52 1.32W	2	33	4	-0.7	2.4
354	450	64	12	N-E	21 18 48.90N	157 52 0.72W	1	19	9	-0.7	2.7
354	528	64	49	N-E	21 18 47.10N	157 52 2.14W	2	32	6	-1.1	2.5
354	644	42	8	N-E	21 18 45.68N	157 52 1.40W	2	33	3	-2.7	0.7
354	714	64	16	N-E	21 18 49.74N	157 52 2.16W	2	24	11	-2.1	0.7
354	744	65	23	S-E	21 18 49.02N	157 52 1.60W	2	34	14	1.7	0.0
354	728	65	42	S-E	21 18 49.02N	157 52 0.30W	2	12	0	2.6	-1.2
354	1012	65	10	N-E	21 18 49.42N	157 52 2.04W	2	35	17	-1.2	0.6
354	1226	65	55	S-E	21 18 49.38N	157 52 2.04W	2	16	17	-1.6	-3.0
354	1244	60	77	N-E	21 18 46.42N	157 51 58.44N	2	35	1	7.4	-1.2
354	1244	65	7	N-E	21 18 45.52N	157 52 0.30W	7	0	0	0.6	-0.3
354	1627	64	21	S-E	21 18 49.55N	157 52 1.20W	2	20	14	0.6	0.1
354	1612	64	27	S-E	21 18 49.00N	157 52 1.62W	2	30	13	0.7	0.1
354	1652	54	23	S-E	21 18 49.92N	157 52 1.32W	2	26	11	-1.7	-0.2
354	1804	42	23	S-E	21 18 49.75N	157 52 1.92W	2	27	13	1.3	0.6
354	1930	54	35	S-E	21 18 50.20N	157 52 1.50W	2	30	15	2.1	0.0
354	1216	65	15	N-E	21 18 49.32N	157 52 0.66W	2	14	14	-1.1	-0.8
354	2118	65	45	N-E	21 18 45.78N	157 52 0.42W	2	31	14	-2.4	-1.1
354	2310	60	35	S-E	21 18 49.02N	157 52 2.52W	2	29	13	0.6	1.0
355	56	99	18	S-E	21 18 49.26N	157 52 1.38W	2	21	9	-1.1	-0.1
355	214	64	25	N-E	21 18 47.04N	157 52 1.20W	2	23	4	-1.2	0.3
355	400	64	34	N-E	21 18 46.88N	157 52 1.62W	2	31	5	-1.3	0.1
355	438	64	17	N-E	21 18 47.40N	157 52 1.62W	2	24	11	-0.8	0.1
355	548	42	31	N-E	21 18 46.62N	157 52 1.32W	2	28	3	-1.6	-0.2

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	GCRN	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
355	622	54	47	N-E	21 18 44.02N	157 52 0.96W	2	33	16	-1.3	-0.6
355	640	45	71	S-E	21 18 43.20N	157 52 4.50W	5	33	0	1.2	3.0
355	1028	65	10	S-E	21 18 45.06N	157 52 2.16W	6	16	7	-3.1	2.7
355	1048	63	36	S-E	21 18 45.62N	157 52 23.82W	16	0	0	8.1	22.3
355	1226	63	14	S-E	21 18 49.74N	157 52 1.32W	2	21	9	1.5	-0.2
355	1318	64	10	S-E	21 18 50.04N	157 52 0.42W	2	14	4	1.9	-1.1
355	1522	64	70	S-E	21 18 48.54N	157 52 1.62W	2	24	1	0.1	0.1
355	1708	42	72	S-E	21 18 48.72N	157 51 50.22W	2	32	10	0.5	-2.3
355	1746	54	68	S-E	21 18 48.54N	157 51 5.74W	4	21	0	0.5	-2.7
355	1656	42	7	S-E	21 18 37.66N	157 52 7.86W	3	0	0	-8.5	6.4
355	1934	54	7	S-E	21 18 44.12N	157 52 4.02W	3	6	2	-5.2	2.5
355	2030	65	64	N-E	21 18 47.52N	157 52 0.65W	2	29	15	-0.7	-2.9
355	2218	65	9	N-E	21 18 42.44N	157 51 52.34W	3	11	5	4.2	-2.1
355	2348	65	77	S-E	21 18 47.52N	157 51 54.36W	3	30	0	-0.7	-7.1
356	16	63	18	N-E	21 18 47.89N	157 52 2.16W	2	23	11	-0.3	0.7
356	310	64	73	S-E	21 18 44.00N	157 51 50.76W	2	30	0	0.4	-10.3
356	452	42	70	N-E	21 18 46.92N	157 52 11.92W	2	31	9	-1.3	2.7
356	432	44	44	N-E	21 18 47.52N	157 52 2.16W	2	32	1	5.6	-0.5
356	620	42	7	N-E	21 18 43.82N	157 52 0.66W	8	0	0	1.7	-0.4
356	720	64	12	N-E	21 18 42.86N	157 52 1.07W	2	20	8	0.8	-0.6
356	938	65	30	S-E	21 18 48.24N	157 52 2.02W	2	34	1	0.0	-2.4
356	1128	65	48	N-E	21 18 48.84N	157 52 3.32W	2	33	16	-1.3	-0.2
356	1214	65	12	N-E	21 18 43.09N	157 52 6.72W	3	20	0	-5.1	-0.9
356	1434	64	45	S-E	21 18 48.30N	157 52 1.50W	2	23	3	0.1	0.0
356	1614	42	38	S-E	21 18 49.32N	157 52 1.62W	2	30	15	1.1	0.5
356	1654	64	10	S-E	21 18 50.40N	157 52 1.62W	2	30	3	2.2	-0.1
356	1804	42	21	S-E	21 18 42.26N	157 52 1.32W	2	27	12	1.1	-0.7
356	1942	65	23	N-E	21 18 46.92N	157 52 1.20W	2	25	12	-1.3	-0.3
356	2130	65	30	N-E	21 18 47.16N	157 52 1.62W	2	27	13	-1.0	0.1
356	2244	65	21	S-E	21 18 49.02N	157 52 1.32W	2	21	4	0.4	-0.1
356	2332	63	42	N-E	21 18 43.26N	157 51 42.19W	2	14	1	-4.0	-1.3
357	28	65	20	S-E	21 18 49.26N	157 52 1.20W	2	26	12	1.1	-0.3
357	224	64	36	N-E	21 18 48.00N	157 52 0.54W	2	23	14	-0.2	-0.3
357	258	42	23	N-E	21 18 47.64N	157 52 0.54W	2	26	15	-0.3	0.0
357	442	64	23	N-E	21 18 45.44N	157 52 0.54W	2	26	13	-1.9	-0.6
357	444	42	29	N-E	21 18 46.44N	157 52 0.16W	2	21	15	-1.6	-0.7
357	628	54	36	N-E	21 18 46.26N	157 52 1.50W	2	32	16	-1.9	-0.9
357	706	65	12	S-E	21 18 48.84N	157 52 1.20W	4	71	10	0.6	-0.4
357	857	65	71	S-E	21 18 49.72N	157 52 0.44W	2	37	5	0.5	-2.1
357	1022	65	18	N-E	21 18 48.24N	157 51 56.84W	2	25	11	0.6	-1.6
357	1146	63	73	S-E	21 18 48.84N	157 52 0.74W	5	31	6	0.6	-2.7
357	1224	65	50	N-E	21 18 45.44N	157 52 0.30W	2	23	6	2.7	-1.2
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TABLE 1A-8 (CONT.)

P/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PORT SIDE TO PIER 18, \*ANTENNA HEIGHT\* +10.0 METERS.

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DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)		
										LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)
357	1536	64	45	S-E	21 18 49.56N	157 52 1.86W	2	24	8	1.4	0.4	-1.3
*357	1606	54	9	S-E	21 18 45.72N	157 52 0.19W	2	10	3	-2.5	-1.3	-1.3
357	1704	42	66	S-E	21 18 49.14N	157 52 0.10W	2	34	15	2.9	0.3	-1.1
357	1750	54	75	S-W	21 18 49.02N	157 52 2.24W	2	33	15	2.8	0.3	-0.3
*357	1854	42	7	S-E	21 18 45.42N	157 52 20.10W	6	0	0	-32.8	14.6	-0.9
*357	2040	65	85	N-W	21 18 49.70N	157 52 2.40W	2	32	15	2.6	0.6	-0.9
357	2234	63	67	S-E	21 18 47.76N	157 52 0.30W	2	28	1	-0.4	-1.2	-1.2
357	2322	99	61	S-E	21 18 49.36N	157 52 3.06W	2	27	13	0.2	1.6	-1.6
*358	28	63	12	N-W	21 18 51.18N	157 51 56.28W	2	11	2	3.0	-1.6	-1.6
*358	106	99	5	S-W	21 18 43.02N	157 51 2.16W	2	11	4	-5.2	0.7	-3.0
*358	134	64	13	S-E	21 18 45.24N	157 51 56.44W	2	18	6	-3.0	-3.0	-3.0
*358	306	42	9	N-E	21 18 56.76N	157 52 7.32W	8	7	2	4.6	5.8	0.4
*358	722	64	62	N-E	21 18 46.62N	157 52 2.04W	2	27	7	-1.6	0.6	-4.5
*358	364	64	7	N-E	21 18 49.36N	157 51 57.00W	2	0	0	0.2	-4.5	-3.7
*358	446	42	78	N-E	21 18 49.60N	157 51 57.78W	2	0	0	0.4	-3.7	-3.7
*358	536	54	6	N-E	21 18 47.40N	157 51 1.20W	2	0	0	-2.4	-2.4	-2.4
*358	642	42	7	N-E	21 18 49.50N	157 51 56.44W	4	0	0	10.5	-1.7	-1.7
*358	726	54	1	N-E	21 18 47.44N	157 52 2.64W	6	38	14	-0.7	0.7	-0.7
*358	1059	45	21	S-W	21 18 47.94N	157 52 1.17W	2	22	14	0.4	0.4	-0.7
*358	1144	43	27	S-W	21 18 49.20N	157 52 1.32W	2	35	17	-2.5	-1.0	-1.0
*358	1244	99	23	N-E	21 18 44.92N	157 52 1.42W	2	27	12	-1.3	-1.3	-1.3
*358	1442	64	44	S-E	21 18 49.64N	157 52 2.04W	2	35	17	0.5	0.5	-2.2
*358	1610	42	41	S-E	21 18 49.14N	157 52 2.04W	2	31	15	0.7	0.6	-1.2
*358	1649	64	12	S-E	21 18 49.22N	157 52 2.04W	2	17	14	1.7	1.2	-1.2
*358	1659	54	19	S-E	21 18 49.66N	157 52 2.04W	2	33	15	0.4	0.5	-0.9
*358	1754	42	19	S-E	21 18 49.60N	157 52 1.50W	2	24	15	0.4	0.4	-0.9
*358	1852	45	14	N-E	21 18 46.68N	157 52 0.72W	2	25	11	-1.2	-0.9	-0.9
*358	2138	65	20	N-E	21 18 47.40N	157 52 1.74W	2	24	11	-0.8	-0.8	-0.8
*358	2216	63	12	S-E	21 18 49.84N	157 52 1.93W	3	16	6	0.6	0.5	-0.5
358	2400	64	47	S-W	21 18 49.62N	157 52 0.88W	2	28	14	1.4	-0.5	-0.5
359	230	64	62	N-E	21 18 47.34N	157 52 1.38W	2	30	1	-0.0	-0.1	-0.1
359	256	42	12	S-E	21 18 47.70N	157 52 0.30W	2	22	14	-0.5	-1.2	-1.2
359	416	64	15	S-W	21 18 47.76N	157 52 1.49W	2	23	11	-0.4	0.6	-0.6
359	446	54	37	N-E	21 18 46.99N	157 52 0.13W	2	24	3	-1.2	-1.3	-1.3
359	544	42	24	N-E	21 18 47.76N	157 52 2.16W	2	23	9	-1.4	0.7	-0.7
359	734	54	27	N-E	21 18 46.56N	157 52 2.32W	2	26	12	-1.5	1.2	-1.2
359	716	65	10	S-E	21 18 50.10N	157 52 1.98W	2	25	5	1.3	0.5	-0.5
359	900	65	51	S-E	21 18 49.44N	157 52 0.20W	3	37	18	1.2	-1.2	-1.2
*359	654	99	10	N-E	21 19 49.34N	157 52 1.50W	5	15	7	-0.9	0.9	-0.9
*359	1056	63	71	S-W	21 18 49.42N	157 52 1.39W	2	33	16	0.2	-0.1	-0.1
*359	1136	99	72	S-W	21 18 46.56N	157 51 56.74W	2	36	18	-1.6	-2.7	-2.7
*359	1246	63	7	S-W	21 18 32.34N	157 52 10.44W	12	0	0	-15.0	4.7	-0.7
*359	1326	92	7	N-E	21 18 57.80N	157 52 2.14W	3	0	0	0.6	0.7	-0.7
*359	1526	64	24	S-E	21 18 49.68N	157 52 2.14W	2	27	13	1.5	-0.7	-1.2
*359	1516	42	12	S-E	21 18 46.80N	157 52 0.30W	2	16	8	-1.4	-1.4	-1.4
360	34	63	7	N-W	21 18 41.22N	157 52 31.26W	6	0	0	-5.2	24.6	-1.4
360	144	64	20	N-E	21 18 47.34N	157 51 59.76W	2	25	7	-0.0	-1.7	-1.7
*360	304	42	6	N-E	21 18 43.20N	157 51 55.14W	3	12	5	-5.0	-6.3	-6.3
*360	329	64	42	N-W	21 18 45.62N	157 52 1.39W	2	14	17	-1.8	-0.1	-0.1
*360	259	54	9	N-E	21 18 45.74N	157 52 0.12W	2	0	0	1.5	-1.3	-1.3
*360	444	42	63	N-E	21 18 47.34N	157 52 0.30W	2	30	0	-0.0	-1.2	-1.2
*360	540	64	74	N-W	21 18 47.00N	157 52 0.42W	2	35	16	-0.9	-0.9	-0.9
*360	636	42	7	N-W	21 18 57.00N	157 52 4.62W	2	0	0	0.3	2.6	-0.6
*360	712	64	7	N-W	21 18 41.14N	157 52 4.42W	2	0	0	-0.0	-1.1	-1.1
*360	810	65	68	S-E	21 18 46.66N	157 52 0.24W	2	36	22	1.0	0.2	-0.2
*360	1070	65	25	N-E	21 18 47.24N	157 52 1.20W	2	21	14	-1.0	-0.2	-0.2
*360	1125	65	29	N-E	21 18 47.26N	157 52 1.20W	2	26	11	-0.2	-0.2	-0.2
*360	1153	63	11	N-E	21 18 45.62N	157 52 1.49W	2	32	14	-2.2	0.0	-0.0
*360	1214	63	31	N-E	21 18 45.36N	157 52 1.49W	2	32	14	-2.2	-1.1	-1.1
*360	1452	64	84	S-E	21 18 49.80N	157 51 56.99W	2	26	17	0.4	-1.4	-1.4
*360	1644	42	45	S-E	21 18 49.60N	157 52 1.16W	2	32	15	0.7	0.5	-0.5
*360	1642	64	7	S-E	21 18 44.22N	157 52 4.30W	2	31	0	-4.0	2.9	-2.9
*360	1703	64	61	S-E	21 18 48.50N	157 52 1.38W	2	33	16	0.7	0.5	-0.5
*360	1752	62	19	S-W	21 18 48.72N	157 52 1.74W	2	24	11	0.5	0.3	-0.3
*360	1848	64	15	S-E	21 18 49.34N	157 52 2.04W	2	22	13	1.5	0.6	-0.6
*360	2000	65	51	N-E	21 18 47.40N	157 52 2.23W	2	28	19	-0.9	0.8	-0.8
*360	2150	63	7	S-E	21 18 17.50N	157 52 1.92W	11	0	0	22.3	2.5	-1.1
*360	2220	63	36	N-E	21 18 49.34N	157 52 7.46W	7	13	1	2.2	6.1	-1.5
*360	2312	63	72	S-W	21 18 47.84N	157 52 0.00W	2	26	0	-0.3	-1.5	-1.5
*361	240	64	72	N-E	21 18 47.84N	157 51 56.74W	6	0	0	-0.3	-2.7	-2.7
361	352	42	35	N-E	21 18 47.70N	157 52 0.16W	2	28	5	-0.4	-0.4	-0.4
*361	430	64	9	N-W	21 18 49.50N	157 52 1.62W	4	14	5	1.3	3.1	-1.1
*361	444	64	39	N-E	21 18 47.10N	157 52 1.20W	2	31	2	-1.1	-0.3	-0.3
*361	536	62	24	N-W	21 18 47.64N	157 52 1.99W	2	29	14	-0.6	-0.4	-0.4
*361	636	54	21	N-W	21 18 46.02N	157 52 1.04W	2	27	12	-1.4	0.5	-0.5
*361	724	65	28	S-E	21 18 49.92N	157 52 2.12W	2	33	15	1.7	1.3	-1.3
*361	910	65	36	S-E	21 18 47.64N	157 52 0.42W	2	35	16	1.5	1.4	-1.4
*361	1104	63	50	S-W	21 18 49.50N	157 52 0.24W	2	34	14	1.5	2.2	-0.2
*361	1204	63	11	N-E	21 18 47.24N	157 52 0.24W	2	32	17	-1.2	-0.5	-0.5
*361	1404	64	34	S-E	21 18 49.14N	157 52 1.74W	2	32	15	0.0	0.3	-0.3
*361	1550	64	23	S-E	21 18 49.34N	157 52 0.04W	2	27	1	1.4	0.4	-1.2
*361	1612	64	16	S-E	21 18 49.28N	157 52 1.32W	2	24	11	2.1	-0.2	-0.2
*361	1656	62	56	S-W	21 18 49.62N	157 52 0.30W	2	32	3	1.4	-1.2	-1.2
*361	1916	65	18	N-E	21 18 48.65N	157 52 0.66W	2	21	10	-0.1	-0.9	-0.9

\* \* FIX NOT USED FOR COMPUTATION OF THE MEAN

# BEST AVAILABLE COPY

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TABLE 1A-8 (CONT.)  
R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)				
							IT	CTS	CTS0	LATITUDE LONGITUDE	
361	2058	65	37	N-W	21 18 41.70N	157 52 31.20W	2	22	6	-6.5	29.7
361	2226	69	22	S-E	21 18 43.14N	157 52 31.66W	2	23	2	-5.1	30.4
361	2250	63	63	N-W	21 18 44.20N	157 53 27.78W	2	25	1	-2.0	34.1
362	12	99	28	S-W	21 18 49.38N	157 52 1.27W	2	23	10	1.2	-0.2
362	154	64	29	N-E	21 18 44.42N	157 52 0.64W	2	22	0	0.2	-1.4
*362	302	42	10	N-F	21 18 47.28N	157 51 57.66W	2	9	0	-0.9	-3.9
362	340	64	23	N-W	21 18 47.22N	157 52 1.58W	2	30	15	-1.2	0.5
*362	400	54	13	N-F	21 18 47.04N	157 52 1.20W	2	16	5	-1.2	-0.3
362	440	42	72	N-W	21 18 49.06N	157 51 59.34W	2	35	17	-0.1	-2.1
362	442	54	59	N-W	21 18 47.44N	157 52 0.65W	2	33	7	-0.7	-0.9
*362	422	65	82	S-E	21 18 47.14N	157 51 45.90W	3	36	1	-1.0	-15.6
362	1004	59	18	N-E	21 18 47.40N	157 52 1.33W	2	24	6	-0.9	-0.1
362	1722	63	63	S-E	21 18 49.02N	157 52 5.47W	2	13	0	0.8	5.1
362	1148	59	48	N-W	21 18 46.20N	157 52 0.66W	2	35	16	-2.0	-0.9
*362	1218	64	13	S-E	21 18 48.90N	157 52 0.64W	2	19	0	0.7	-0.9
362	1502	64	60	S-W	21 18 49.26N	157 52 1.32W	2	32	11	1.1	-0.2
362	1602	42	49	S-E	21 18 49.26N	157 52 2.23W	2	33	15	1.1	0.4
362	1725	54	67	S-E	21 18 49.62N	157 52 1.32W	2	31	8	1.4	-0.2
362	1748	42	16	S-W	21 18 49.38N	157 52 1.39W	2	22	10	1.8	-0.1
*362	1554	54	11	S-W	21 18 49.62N	157 52 2.16W	5	16	7	1.4	0.7
362	2010	65	68	N-E	21 18 47.74N	157 52 4.02W	3	25	0	-0.5	2.5
362	2202	63	52	N-E	21 18 49.30N	157 52 1.08W	2	21	3	0.1	-1.4
362	2304	59	64	S-E	21 18 48.00N	157 52 1.98W	2	28	14	0.4	0.5
362	2350	63	17	N-W	21 18 46.00N	157 52 1.74W	2	20	0	-2.1	0.3
*363	50	99	8	S-W	21 18 47.04N	157 52 3.48W	2	9	3	-1.2	2.0
*363	108	44	9	N-F	21 18 54.60N	157 52 5.72W	3	10	1	6.4	5.3
*363	248	44	76	N-W	21 18 49.54N	157 52 15.64W	2	22	0	0.3	14.2
363	348	42	39	N-E	21 18 47.54N	157 52 0.11W	2	23	9	-0.5	-1.3
*363	442	44	7	N-W	21 18 47.04N	157 52 3.30W	0	0	10.4	1.3	
363	444	44	50	N-E	21 18 47.04N	157 52 1.12W	30	14	1.2	-0.1	
363	444	42	22	N-W	21 18 47.54N	157 52 1.32W	2	26	10	-1.5	-0.2
363	460	54	14	S-E	21 18 45.54N	157 52 2.22W	2	22	16	-0.7	0.9
363	734	65	40	S-E	21 18 47.04N	157 52 2.24W	2	35	17	0.7	1.5
363	200	65	24	S-E	21 18 49.70N	157 52 0.72W	2	30	3	0.7	-0.8
363	111	64	47	N-F	21 18 46.26N	157 52 2.77W	2	33	12	-1.2	-1.2
363	1229	59	19	N-W	21 18 45.60N	157 52 2.77W	2	25	12	-2.5	1.2
363	1414	64	53	S-E	21 18 49.32N	157 52 1.50W	2	32	15	0.4	0.0
363	1506	42	15	S-E	21 18 47.04N	157 52 1.62W	2	23	10	1.4	0.1
363	1600	64	15	S-W	21 18 49.00N	157 52 1.74W	2	22	10	0.0	0.1
363	1620	64	24	S-E	21 18 49.34N	157 52 3.18W	2	15	2	1.2	1.7
363	1644	42	50	S-W	21 18 50.04N	157 52 2.16W	2	21	15	1.9	0.7
363	1800	54	34	S-E	21 18 50.40N	157 52 1.04W	2	31	14	2.3	0.5
363	1924	65	28	N-F	21 18 48.04N	157 52 0.66W	2	27	13	-0.1	-0.8
363	2110	65	25	N-W	21 18 47.54N	157 52 2.40W	2	26	2	-0.5	0.0
*363	2149	99	13	S-E	21 18 51.56N	157 52 0.54W	2	13	0	3.8	4.5
363	2300	63	45	N-W	21 18 46.80N	157 52 2.16W	2	35	17	-1.4	0.7

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8  
R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)				
							IT	CTS	CTS0	LATITUDE LONGITUDE	
363	2342	66	45	S-W	21 18 50.70N	157 52 0.72W	2	29	13	2.8	-0.4
364	200	64	42	N-F	21 18 47.04N	157 52 1.32W	2	28	10	-0.6	0.2
*364	256	42	12	N-F	21 18 47.04N	157 51 50.42W	2	15	6	-2.3	-0.1
364	248	64	20	N-E	21 18 46.32N	157 52 1.62W	2	27	12	-1.2	2.5
364	416	42	64	N-W	21 18 47.52N	157 52 1.12W	2	22	3	-0.7	0.2
364	544	64	45	S-E	21 18 46.54N	157 52 1.62W	2	34	17	-1.2	-2.4
364	646	65	16	S-E	21 18 49.54N	157 52 2.24W	2	24	7	1.1	-2.9
364	622	65	41	S-E	21 18 49.32N	157 52 0.72W	3	37	19	1.1	-1.7
*364	1212	63	7	S-E	21 18 43.20N	157 52 0.90W	4	3	1	-5.0	3.6
*364	1310	62	7	N-F	21 18 40.92N	157 52 0.61W	8	0	0	2.7	3.7
*364	938	69	11	N-F	21 18 46.94N	157 51 59.69W	2	16	7	-2.1	-2.9
*364	1022	63	75	S-E	21 18 48.18N	157 51 53.64W	11	0	8	-0.5	-1.1
364	1118	69	73	N-W	21 18 46.62N	157 51 56.34W	3	36	16	-1.4	-2.1
364	1326	64	20	S-E	21 18 49.92N	157 52 1.60W	2	26	12	1.8	-2.4
364	1510	64	41	S-E	21 18 49.52N	157 52 1.32W	2	33	15	1.4	-2.2
364	1656	42	54	S-E	21 18 49.14N	157 52 2.16W	2	34	16	0.3	0.7
*364	1708	64	74	S-E	21 18 49.02N	157 52 2.54W	7	0	0	0.9	1.2
*364	1746	42	14	S-E	21 18 49.59N	157 52 1.34W	2	21	10	2.4	-0.1
*364	1818	65	9	N-E	21 18 49.24N	157 51 56.98W	2	10	4	1.0	-2.5
*364	1859	64	7	S-E	21 18 39.34N	157 52 2.64W	4	1	1	-7.3	1.2
364	2020	65	71	N-W	21 18 47.16N	157 52 1.02W	2	31	7	-1.3	-2.4
*364	2120	63	71	N-E	21 18 55.02N	157 52 42.84W	3	30	2	-1.2	41.4
364	2236	69	39	S-E	21 18 49.76N	157 52 1.04W	2	29	14	2.9	0.5
*364	2400	63	11	N-W	21 18 47.40N	157 52 2.52W	3	14	1	-0.4	1.0
365	20	69	14	S-W	21 18 48.04N	157 52 0.94W	2	21	10	0.6	-3.6
365	114	64	16	N-E	21 18 49.65N	157 51 59.44W	2	21	7	0.5	-2.1
365	246	64	52	N-W	21 18 47.22N	157 52 1.20W	2	34	16	-1.0	-2.3
365	242	62	49	N-E	21 18 47.24N	157 52 1.04W	2	33	16	-0.4	-0.4
365	444	64	48	N-E	21 18 47.42N	157 52 1.04W	2	22	2	-0.5	0.2
*365	444	64	20	N-W	21 18 49.24N	157 52 1.32W	2	25	9	-1.7	-2.2
365	744	65	58	S-E	21 18 49.24N	157 52 1.32W	2	33	6	2.8	-2.2
365	630	65	17	S-E	21 18 49.62N	157 52 2.14W	2	26	12	1.4	-1.3
365	1014	60	30	N-E	21 18 46.26N	157 52 1.20W	2	29	11	1.4	-1.3
365	1120	63	26	S-E	21 18 49.38N	157 52 2.04W	3	29	13	1.2	0.6
*365	1159	69	29	N-W	21 18 46.02N	157 52 1.02W	2	30	2	-2.2	0.1
365	1422	64	76	S-E	21 18 49.50N	157 52 1.86W	2	22	1	0.4	0.4
365	1524	42	17	S-E	21 18 49.74N	157 52 1.34W	2	22	6	1.5	-0.1
*365	1610	64	9	S-E	21 18 44.46N	157 52 3.97W	3	11	1	-1.7	2.5
365	1650	42	44	S-E	21 18 50.14N	157 52 1.20W	2	32	15	2.0	-0.1
365	1804	64	26	S-E	21 18 50.58N	157 52 2.16W	2	29	13	2.4	0.7
365	1932	65	42	N-E	21 18 47.04N	157 52 1.20W	2	29	13	-0.3	-0.3
365	2120	65	16	N-W	21 18 45.66N	157 52 3.18W	2	23	10	-2.5	1.7
365	2308	63	32	N-W	21 18 47.58N	157 52 1.50W	2	29	12	-0.6	0.0
* 1	210	64	61	N-E							

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TABLE 1A-8 (CONT.)

F/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

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DAY	GMT	SAT	ELEV	GFCM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)					
							IT	CTS	C150	LATITUDE LONGITUDE		
*	1	358	64	12	N-W	21 18 43.44N	157 52 1.32W	5	20	9	-4.4	-2.2
	434	42	61	N-W	21 18 47.04N	157 52 1.39W	2	33	1	-1.2	-0.1	
	550	54	34	N-W	21 18 47.42N	157 52 1.64W	2	21	15	-1.0	-2.4	
*	624	42	7	N-W	21 19 34.74N	157 52 5.84W	12	0	0	46.5	4.4	
	656	65	23	S-E	21 18 50.40N	157 52 2.16W	2	29	10	2.2	0.7	
	642	65	43	S-E	21 18 50.70N	157 52 5.94N	2	35	19	2.5	-1.7	
	1032	63	65	S-W	21 18 49.74N	157 52 0.84W	2	33	7	0.6	-2.6	
	1254	92	74	S-W	21 18 47.94N	157 52 6.84W	2	31	15	-0.3	-0.6	
*	1224	63	7	S-W	21 17 54.60N	157 52 7.20W	2	0	0	-53.6	5.7	
*	1240	99	10	N-W	21 18 46.02N	157 52 1.20W	2	15	8	-2.2	-0.3	
	1334	64	29	S-E	21 18 49.82N	157 52 1.50W	2	31	15	1.7	-0.0	
	1522	64	28	S-E	21 18 49.02N	157 52 1.32W	2	27	12	1.7	-0.6	
	1554	42	52	S-E	21 18 48.90N	157 52 1.60W	2	33	6	0.7	-0.9	
*	1712	54	73	S-W	21 18 48.79N	157 52 2.24W	2	33	6	0.6	-0.9	
*	1742	42	13	S-W	21 18 50.10N	157 52 1.50W	2	19	9	1.3	-0.0	
*	1748	65	1	N-E	21 18 49.72N	157 52 5.56W	2	18	6	-23.7	0.0	
*	1750	64	7	S-E	21 18 49.34N	157 52 2.24W	2	20	9	-2.0	-0.3	
*	2208	99	23	N-E	21 18 49.20N	157 52 2.24W	2	22	11	2.1	-0.1	
*	2226	63	77	N-W	21 18 49.32N	157 52 5.60W	5	17	1	0.6	-1.7	
*	2354	99	26	S-W	21 18 49.94N	157 52 1.98W	2	24	12	1.7	0.5	
*	2	12	63	7	N-W	21 18 58.20N	157 52 2.28W	6	0	0	10.0	0.3
*	2	122	64	23	N-E	21 18 49.50N	157 52 0.04W	2	27	11	0.3	-2.4
*	2	308	64	36	N-W	21 18 47.52N	157 52 2.04W	2	28	1	-0.7	0.6
*	2	340	42	44	N-E	21 18 47.64N	157 52 0.54W	2	28	3	-0.6	-2.0
*	2	459	64	65	N-E	21 18 49.65N	157 52 7.32W	11	2	0	0.5	5.9
*	2	526	62	18	N-W	21 18 47.82N	157 52 1.50W	2	20	0	-0.4	-0.0
*	2	612	65	7	S-E	21 18 49.42N	157 51 55.64W	2	0	0	-6.2	-4.9
*	2	650	54	7	N-W	21 18 49.42N	157 52 1.32W	7	0	0	3.2	-3.2
*	2	724	65	76	S-E	21 18 49.34N	157 52 6.24W	2	33	1	1.3	4.8
*	2	742	64	11	S-W	21 18 50.16N	157 52 2.52W	6	0	0	2.0	1.0
*	2	1130	61	17	S-W	21 18 48.42N	157 52 6.24W	2	21	5	0.4	1.2
*	2	1249	64	6	S-E	21 18 49.34N	157 52 1.06W	2	19	0	-0.2	-0.4
*	2	1542	65	63	N-E	21 18 48.94N	157 52 0.06W	2	27	1	0.1	-1.4
*	2	2130	63	38	N-E	21 18 49.62N	157 51 55.85W	2	11	0	1.4	-2.5
*	2	2248	99	66	S-E	21 18 49.12N	157 52 2.40W	2	30	14	-2.0	0.9
*	2	2318	63	23	N-W	21 18 47.82N	157 52 2.03W	2	20	14	-0.4	0.5
*	*	*	*	*	*	*	*	*	*	*	*	
*	*	*	*	*	*	*	*	*	*	*	*	

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8

P/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	GFCM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)					
							IT	CTS	C150	LATITUDE LONGITUDE		
1	1210	69	17	N-E	21 18 45.56N	157 52 2.64W	2	25	11	-1.6	0.5	
3	1242	64	43	S-E	21 18 44.24N	157 52 1.74W	2	33	15	0.0	0.3	
3	1530	64	13	S-W	21 18 51.18N	157 52 6.00W	2	15	1	3.0	5.4	
3	1550	42	54	S-E	21 18 49.48N	157 52 1.32W	2	34	16	0.3	-0.2	
3	1715	54	56	S-W	21 18 43.14N	157 52 1.08W	2	22	1	0.9	-0.4	
*	3	1736	42	11	S-W	21 18 51.12N	157 52 1.33W	2	17	7	2.3	-0.1
*	3	1756	65	23	N-E	21 18 47.70N	157 51 59.75W	2	24	7	-1.5	-1.7
*	3	2040	65	32	N-W	21 18 45.56N	157 52 2.16W	2	30	15	-1.6	0.7
*	3	2140	69	14	S-E	21 18 41.64N	157 51 54.86W	6	14	0	-1.3	-6.6
*	3	2226	73	59	N-W	21 18 48.00N	157 52 0.04W	2	34	0	0.2	-1.4
*	3	2226	69	43	S-W	21 18 50.44N	157 52 2.08W	2	26	12	2.7	0.6
4	134	64	34	N-E	21 18 47.62N	157 52 0.04W	2	23	11	-0.7	-1.4	
4	319	64	24	N-W	21 18 47.34N	157 52 1.42W	2	19	2	-0.0	-0.1	
4	218	42	56	N-E	21 18 47.82N	157 51 59.75W	2	25	0	-2.4	-1.8	
4	622	42	16	N-W	21 18 47.15N	157 52 1.20W	2	20	0	-1.3	-0.3	
4	622	64	56	S-E	21 18 46.42N	157 52 2.40W	2	28	3	-1.0	0.2	
4	706	65	34	S-E	21 18 50.40N	157 52 2.82W	2	33	16	2.2	1.3	
3	652	65	30	S-W	21 18 49.22N	157 52 0.30W	2	26	1	1.7	-1.2	
3	1024	99	47	N-E	21 18 49.12N	157 52 2.52W	2	34	16	-0.1	1.0	
3	1044	63	46	S-W	21 18 49.50N	157 52 1.74W	2	24	8	1.3	0.3	
*	*	*	*	*	*	*	*	*	*	*	*	
*	*	*	*	*	*	*	*	*	*	*	*	
4	1102	63	11	N-W	21 18 46.20N	157 52 1.72W	2	34	11	-2.0	-0.3	
*	4	1138	63	11	S-W	21 18 50.22N	157 52 2.70W	2	14	1	2.0	1.2
*	4	1252	65	7	N-W	21 18 50.04N	157 52 11.16W	2	10	0	0.0	0.7
*	4	1440	64	51	S-E	21 18 47.32N	157 52 1.32W	2	34	16	1.1	-0.2
*	4	1520	42	21	S-E	21 18 47.32N	157 52 6.72W	2	19	2	1.2	-0.0
*	4	1624	64	53	S-E	21 18 49.54N	157 52 2.16W	2	35	17	2.3	-0.7
*	4	1644	42	39	S-W	21 18 49.04N	157 52 1.32W	2	28	13	1.4	-0.2
*	4	1812	64	15	S-W	21 18 47.44N	157 52 2.24W	2	22	12	1.2	2.9
*	4	1952	65	87	N-W	21 18 47.76N	157 52 20.22W	2	71	12	-0.3	18.7
4	2132	63	44	N-E	21 18 47.02N	157 52 0.04W	2	14	0	0.8	-1.4	
5	1604	75	34	N-E	21 18 47.26N	157 52 0.18W	2	27	11	0.5	-1.3	
5	2050	65	21	N-W	21 18 46.32N	157 52 2.16W	2	22	8	1.7	0.7	
5	2236	63	42	N-E	21 18 47.40N	157 52 1.16W	2	35	17	-0.4	0.4	
5	2256	69	72	S-W	21 18 49.32N	157 52 1.12W	2	20	1	1.1	-0.7	
6	146	64	65	N-E	21 18 47.52N	157 51 59.26W	2	28	0	-0.7	-0.5	
6	222	64	13	S-E	21 18 51.12N	157 52 1.70W	4	12	0	2.0	-0.1	
6	554	64	56	N-W	21 18 47.76N	157 52 0.42W	2	34	17	-0.5	-1.1	
6	629	65	10	S-E	21 18 50.76N	157 52 1.50W	2	24	13	2.6	0.6	
6	2334	69	26	S-W	21 18 49.56N	157 52 1.06W	2	25	12	1.8	0.4	
7	52	64	19	N-E	21 18 47.22N	157 51 59.26W	2	21	9	-1.0	-2.3	
7	238	64	64	N-W	21 18 46.68N	157 52 1.38W	2	21	2	-1.6	-0.1	
7	416	64	52	N-E	21 18 47.34N	157 52 1.52W	2	33	15	-0.0	0.1	
7	602	64	16	N-W	21 18 46.02N	157 52 1.50W	2	21	10	-2.2	0.0	
7	724	65	67	S-E	21 18 48.54N	157 52 4.02W	2	30	19	0.3	2.6	
*	*	*	*	*	*	*	*	*	*	*	*	

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

AD-A047 586

HAWAII INST OF GEOPHYSICS HONOLULU  
THE ACCURACY OF CHARTED PORT POSITIONS IN THE PACIFIC AS DEFINED--ETC(U)  
OCT 77 V M HANNA

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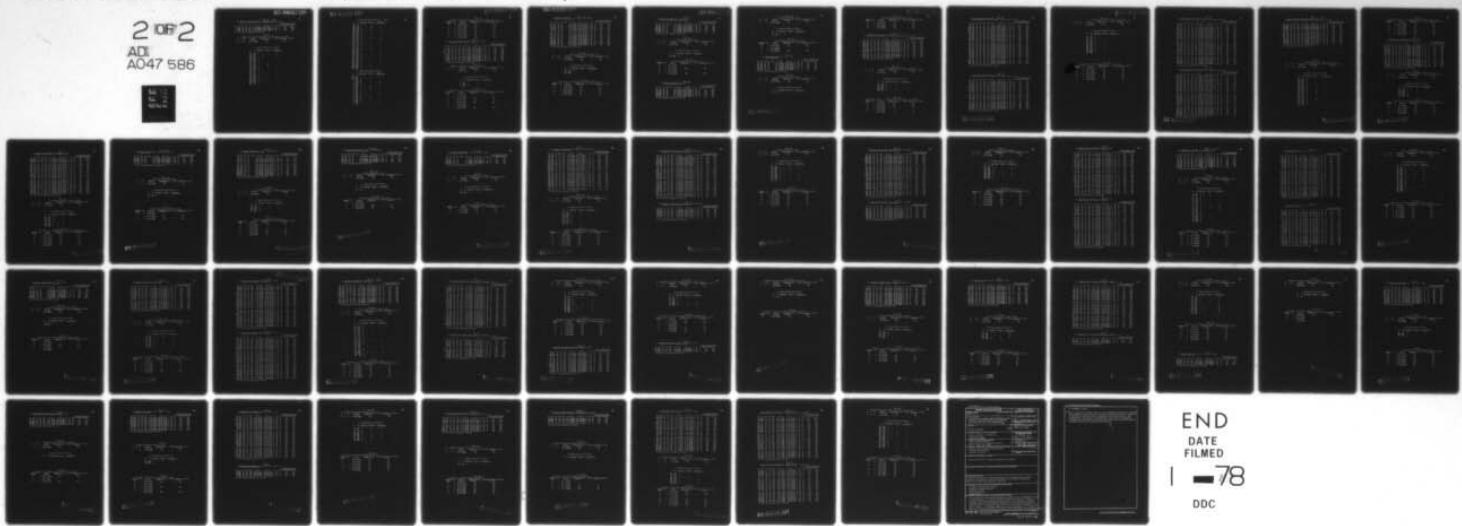
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TABLE 1A-8 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII  
SECURED WITH PORT SIDE TO PIER 19, 'ANTENNA HEIGHT' +19.0 METERS.

DAY	GMT	SAT	ELEV	CECM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
• 7 510	65	14	S-W	21 23 35.16N	157 46 22.92W	4	15	5	200.0	201.4	
7 530	99	19	N-E	21 18 46.92N	157 52 0.66W	3	25	11	-1.3	-0.8	
7 1029	63	22	S-W	21 18 46.68N	157 42 1.50W	2	26	0	1.5	0.0	
7 1118	99	42	N-W	21 18 46.98N	157 52 1.32W	2	24	0	-1.2	-0.2	
• 7 1400	64	77	S-E	21 18 46.30N	157 51 55.80W	3	34	1	0.1	-5.7	

• = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1B-2  
ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 19, 'ANT. HEIGHT' +19.0 METERS

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
377	125	252	21 18 46.19N 157 52 1.42W	1.4	0.1

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
353	436	X		
353	812	X		
353	1038		X	X
353	1514		X	
353	1702	X		
353	1718		X	
353	1900	X		
353	1910	X		
353	2214	X		
354	450	X		
354	644	X		X
354	1012	X		
354	1154	X		
354	1344	X		X
355	840			X
355	1028	X		X
355	1048		X	
355	1226	X		
355	1338	X		
355	1856	X		
355	1934	X		
355	2214	X		
355	2349		X	
356	210			
356	632	X		X
356	720	X		
356	1314	X		
356	2112			X
357	706	X		
357	1046		X	
357	1236	X		
357	1520	X		
357	1604	X		
357	1854	X		X
357	2042		X	
358	28	X		
358	126	X		
359	136	X		

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ALL PROBLEM PASSES ARE LISTED BELOW (CONT.)

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>5
358	306	x		x
358	354	x		
358	448		x	x
358	535			x
358	640	x		
358	726			x
358	1630	x		
358	2216			
359	954	x		
359	1134		x	x
359	1246	x		x
359	1325	x		x
359	1514	x		
359	1610	x		
359	1906	x		
360	2204			x
360	34			x
360	304	x		x
360	358	x		
362	240		x	
360	656	x		
360	732	x		
360	1020	x		
360	1462	x		
360	1542	x		
360	2150	x		
360	2202		x	x
361	240	x		x
361	430	x		
361	1256	x		
361	1514	x		
361	2058	x		x
361	2226	x		x
361	2250	x		x
362	300	x		
362	400	x		
362	822		x	
362	1318	x		
362	1854	x		x
363	50	x		
363	108	x		
363	248	x		x
363	442	x		x
363	2158	x		
364	256	x		
364	1212	x		
364	1310	x		x
364	938	x		x
364	1408	x		x
364	1708	x		x
364	1746	x		
364	1932	x		
364	1858	x		

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>5
364	2210			x
364	2400	x		
365	644	x		x
365	1422		x	x
365	1610	x		
1	252	x		
1	358	x		x
1	626	x		x
1	1224	x		x
1	1240	x		
1	1742	x		
1	1902	x		x
1	2226	x		x
2	42	x		x
2	454			x
2	612	x		
2	650	x		x
2	754		x	
2	942	x		x
2	1248	x		
3	32	x		x
3	218	x		
3	246	x		x
3	1718	x		
3	2140	x		x
4	620	x		
4	654	x		x
4	920	x		
4	1138	x		
4	1252	x		x
4	1952	x		
6	322	x		
7	910	x		
7	1400	x		x

TABLE 1C-8

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 40, 'ANT. HEIGHT' +19.0 METERS						
SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)		
42	45	21 16 48.29N 157 52 1.45W	1.1 1.8	0.2 0.3		
54	44	21 18 48.25N 157 52 1.45W	1.1 1.8	0.2 0.3		
63	26	21 18 48.26N 157 52 1.53W	1.0 2.3	0.2 0.4		
64	45	21 18 48.29N 157 52 1.45W	1.1 1.8	0.2 0.3		
65	52	21 18 48.27N 157 52 1.48W	1.2 1.6	0.2 0.2		
96	40	21 16 48.26N 157 52 1.52W	1.1 1.8	0.2 0.3		

TABLE 1A-9

P/V KANA KEOKI 1974 POSITIONAL DATA, HONOLULU, HAWAII  
ACCRED TO WEST SIDE OF PIER 40 ( A.P. ).

DAY	GMT	SAT	ELEV	CECM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)				
								CTS	CTS0	LATITUDE	LONGITUDE	
9	100	64	25	N-E	21 16 3.72N	157 52 52.74W	4	22	6	-0.4	-1.3	
9	250	64	30	N-W	21 16 2.22N	157 52 54.20W	2	23	9	-2.1	0.8	
9	410	42	43	N-W	21 16 4.44N	157 52 54.24W	2	17	4	-0.1	2.2	
*	9	550	65	S-E	21 16 3.00N	157 52 54.43W	3	12	6	-1.3	0.4	
*	9	620	64	10	N-W	21 16 2.29N	157 52 54.65W	3	15	5	-2.0	0.5
*	9	734	65	67	S-W	21 19 3.44N	157 52 37.20W	9	0	0	-0.4	-16.9
*	9	902	99	11	N-E	21 16 53.22N	157 52 54.65W	2	14	6	1.5	-2.1
*	9	918	63	33	S-E	21 16 55.54N	157 52 34.92W	10	11	0	-1.7	3.2
9	1044	59	76	N-W	21 16 21.64N	157 52 54.20W	2	34	16	-1.7	-1.2	
9	1124	63	15	S-W	21 16 4.93N	157 52 54.24W	2	20	9	-0.6	-0.5	
*	9	1224	46	12	S-E	21 16 3.72N	157 52 54.45W	22	18	8	-0.4	-0.4
9	1400	64	64	S-E	21 16 6.74N	157 52 54.06W	22	35	14	0.4	-0.2	
9	1540	64	13	S-E	21 19 2.70N	157 52 56.86W	14	6	-1.6	4.8		
9	1724	64	26	S-W	21 19 6.60N	157 52 56.82W	22	25	5	2.3	-0.1	
9	1622	65	67	N-F	21 16 54.65N	157 52 52.38W	22	25	0	1.1	-1.7	
9	2200	69	43	S-E	21 19 6.00N	157 52 53.40W	2	30	14	-1.7	-0.7	
9	2254	63	21	N-W	21 19 4.02N	157 52 53.94W	2	26	0	-0.3	-0.1	

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1B-9

ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 40 ( A.P. ).

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
17	6	11	21 19 4.31N 157 52 54.09W	1.6 1.7	0.4 0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS <15 >75	DEVIATION >25 >10 SECS OF ARC
9	550	X		
9	608	X		
9	734		X	X
9	902	X		
9	918		X	X
9	1226	X		

TABLE 1C-9

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 40 ( A.P. ).

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	21 16 4.44N 157 52 54.24W		
54	2	21 19 3.57N 157 52 56.55W	1.2 3.3	0.2 2.1
63	2	21 19 3.57N 157 52 56.55W	1.2 3.3	0.2 2.1
64	3	21 19 4.58N 157 52 55.54W	2.0 2.8	1.1 1.6
65	1	21 16 4.44N 157 52 54.24W		
96	2	21 19 3.57N 157 52 56.55W	1.2 3.3	0.2 2.3

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TABLE 2A-1  
P/V MAHI 1970 POSITIONAL DATA, PAGO PAGO, SAMOA ISLANDS  
ACCDED TO THE "OIL DOCK"

90

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF APC)		
								CTS	CTS0	LATITUDE LONGITUDE
154	344	64	20		14 16 38.42S	170 40 55.84W	2	22	11	3.6 0.5
154	345	62	22		14 16 33.95S	170 40 54.72W	2	26	10	-0.9 1.4
154	624	64	84		14 16 32.10S	170 40 54.17W	3	32	6	-7.8 -3.5
154	1242	63	12		14 16 34.62S	170 40 55.50W	2	28	12	-2.6 -2.7
154	1342	64	26		14 16 34.68S	170 40 54.18W	2	23	10	-0.8 -1.1
154	1814	63	22		14 16 35.82S	170 40 54.54W	2	25	11	0.5 0.1
154	1828	64	28		14 16 34.62S	170 40 54.24W	2	25	11	-0.8 1.2
154	1956	62	63		14 16 35.02S	170 40 54.13W	2	32	15	-0.9 -1.1
154	2056	64	43		14 16 35.42S	170 40 54.20W	2	29	14	0.5 -0.1
154	2142	64	17		14 16 36.44S	170 40 54.39W	3	14	3	1.6 3.1
155	14	63	26		14 16 36.78S	170 40 55.62W	2	22	1	1.9 0.3
155	104	64	12		14 16 33.79S	170 40 54.19W	2	19	9	-1.1 -1.1
155	200	63	33		14 16 35.64S	170 40 54.50W	2	24	9	0.7 0.2
155	295	64	57		14 16 36.16S	170 40 54.74W	2	30	13	0.3 0.4
155	440	62	43		14 16 35.76S	170 40 54.56W	2	22	14	0.0 -0.8
155	628	62	17		14 16 44.34S	170 40 54.73W	2	16	5	0.4 -1.5
155	738	64	31		14 16 34.20S	170 40 54.66W	2	23	9	-0.7 -1.2
155	926	64	24		14 16 35.34S	170 40 54.28W	2	16	6	0.4 1.0
155	1140	63	10		14 16 36.61S	170 40 54.32W	2	12	1	1.7 -1.0
155	1324	63	42		14 16 35.29S	170 40 54.05W	2	26	12	0.4 1.7
155	1436	64	75		14 16 33.09S	170 40 54.86W	3	26	1	-1.0 0.5
155	1602	42	19		14 16 32.64S	170 40 54.78W	2	23	10	-2.3 -3.5
155	1750	42	38		14 16 32.10S	170 40 54.98W	2	25	11	-2.8 -1.4
155	1902	64	15		14 16 34.14S	170 40 54.30W	2	22	10	-0.8 -1.0
155	2050	64	46		14 16 34.06S	170 40 54.08W	2	26	11	1.2 -0.2

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 2B-1

ARITHMETIC MEAN SOLUTION AT PAGO PAGO OIL DOCK

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
25	4	21	14 16 34.91S 170 40 55.32W	1.5 1.4	0.3 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS <15 >75	DEVIATION >5 >10 SECs OF APC
154	824		X	
155	104	X		
155	628			X
155	1140	X		

TABLE 2C-1

BY SATELLITE ---- ARITHMETIC MEAN SOLUTION AT PAGO PAGO OIL DOCK

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	14 16 33.70S 170 40 54.23W	1.6	0.6
54	5	14 16 33.70S 170 40 54.23W	1.6	0.6
62	5	14 16 33.70S 170 40 54.23W	1.6	0.6
64	6	14 16 34.60S 170 40 54.50W	2.3	1.0
			1.7	0.7

TABLE 3A-1  
R/V MAHI 1970 POSITIONAL DATA, SUVA, FIJI  
RECD AT THE EAST END OF KING'S WHARF

DAY	GMT	SAT	ELEV	GEOF	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
175	619	64	23		18 7 46.565	178 25 35.54E	2	22	2	-6.9	1.9
175	626	64	34		18 7 47.645	178 25 33.00E	2	28	13	-2.6	-1.1
175	1216	63	61		18 7 46.625	178 25 33.24E	2	28	1	-0.7	-0.9
175	1240	64	21		18 7 48.065	178 25 34.66E	2	27	12	-0.7	0.5
*175	1404	63	9		18 7 43.085	178 25 34.50E	6	11	5	-4.3	-3.2
175	1426	64	36		18 7 47.665	178 25 33.42E	2	32	15	0.1	-0.7
175	1620	42	70		18 7 45.025	178 25 34.98E	2	33	13	-1.3	0.9
*175	1806	64	10		18 7 41.765	178 25 35.40E	4	14	4	-5.6	1.3
175	1846	64	70		18 7 49.845	178 25 33.54E	2	36	18	1.5	-0.6

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-1  
ARITHMETIC MEAN SOLUTION AT SUVA

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
9	2	7	18 7 47.365 178 25 34.10E	1.0 1.1	0.4 0.4

ALL PROBLEM FASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION <15 >75 >5 >10 SECS OF ARC
			<15	>75	
175	1404	X			X
175	1806	X			

TABLE 3C-1  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT SUVA

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	18 7 46.025 178 25 34.98E		
54	2	18 7 47.045 178 25 34.77E	1.4	0.2
*63	1	18 7 46.025 178 25 34.98E		
64	3	18 7 47.185 178 25 34.32E	1.0	0.6

TABLE 3A-2  
R/V MAHI 1970 POSITIONAL DATA, ELVA, FIJI  
AT DOLPHINS, NEAR THE CAYOCCK

DAY	GMT	SAT	ELEV	GEOF	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
176	145	54	46		18 7 41.425	178 25 35.10E	2	25	1	2.1	-2.5
176	404	42	52		18 7 48.565	178 25 38.44E	2	32	14	0.6	1.0
*176	552	42	14		18 7 52.145	178 25 35.10E	2	19	9	-1.3	-2.6
176	1128	63	26		18 7 49.105	178 25 40.02E	2	26	1	-0.8	2.3
176	1314	63	29		18 7 46.225	178 25 35.14E	2	31	14	-2.5	-1.4
*176	1334	54	81		18 7 47.565	178 25 42.36E	2	34	15	2.6	4.0
176	1526	42	23		18 7 50.005	178 25 40.24E	2	28	15	0.1	1.7
176	1700	42	34		18 7 50.525	178 25 37.55E	2	31	14	1.5	-1.4
176	2314	63	21		18 7 47.605	178 25 38.54E	2	23	1	-2.5	1.0

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-2  
ARITHMETIC MEAN ECLUTION AT SUVA

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
10	2	2	18 7 49.00S 178 25 37.55E	1.9 1.6	0.7 0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
176	552	X		
176	1334	X		

TABLE 3C-2  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT SUVA

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	3	18 7 46.72S 178 25 37.68E	0.7 1.3	0.4 0.8
54	1	18 7 46.55S 178 25 38.58E		
63	3	18 7 49.72S 178 25 37.68E	0.7 1.3	0.4 0.8

TABLE 3A-3  
R/V MAHI 1970 POSITIONAL DATA, SUVA, FIJI  
SHIP INSIDE DRYDOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
177	244	54	20		18 7 45.48S	178 25 36.16E	2	26	6	-4.1	0.8
177	312	42	17		18 7 47.34S	178 25 40.42E	2	24	11	-2.3	3.5
177	456	42	47		18 7 49.14S	178 25 34.49E	2	33	13	-6.8	-1.1
177	648	64	34		18 7 48.95S	178 25 35.60E	2	29	10	-3.6	2.2
177	840	64	23		18 7 49.14S	178 25 37.26E	3	17	4	-0.5	-0.1
177	1432	54	18		18 7 54.90S	178 25 37.50E	2	12	1	6.3	0.1
177	1616	42	72		18 7 50.40S	178 25 34.44E	2	26	1	0.8	-2.0
177	1800	42	7		18 7 45.96S	178 25 35.44E	2	7	1	-7.6	-2.0
177	1958	64	47		18 7 51.48S	178 25 36.30E	2	34	16	1.9	-1.1

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-3  
ARITHMETIC MEAN SOLUTION AT SUVA

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
9	1	8	18 7 49.60S 178 25 37.40E	2.9 2.2	1.0 0.8

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
177	1806	X		

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TABLE 3C-3  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT SUVA

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	3	18 7 48.54S 178 25 36.40E	1.5 3.6	0.9 2.1
54	2	18 7 48.24S 178 25 37.50E	1.3 4.8	0.9 3.4
64	3	18 7 48.94S 178 25 36.40E	1.5 3.6	0.9 2.1

TABLE 3A-4

P/V KABA KFOKI 1971 POSITIONAL DATA, SUVA, FIJI  
MOORED AT THE NORTH WEST END OF KING'S WHARF, ANTENNA HEIGHT 75 METERS

DAY	GMT	SAT	ELEV	CECM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OR ARC)	
										LATITUDE	LONGITUDE
201	742	65	52	N-E	18 7 57.00S	178 25 24.73E	2	23	15	0.7	-1.9
*201	612	63	8	N-E	18 7 41.22S	178 25 25.62E	8	7	1	-1.1	-1.1
*201	530	65	13	N-W	18 7 55.50S	178 25 27.11E	2	17	1	-0.8	0.5
201	1000	64	73	S-E	18 7 55.62S	178 25 26.44E	2	30	14	-0.7	-0.0
*201	1056	63	78	N-W	18 7 57.50S	178 25 32.73E	3	32	12	1.3	0.0
*201	1148	54	5	S-W	18 7 56.22S	178 25 24.91E	6	10	4	-0.1	-1.8
201	1435	42	31	N-E	18 7 56.64S	178 25 24.42E	2	29	2	0.4	-1.1
*201	1532	64	11	N-E	18 7 55.58S	178 25 26.76E	2	18	8	-0.3	0.1
201	1624	42	26	N-W	18 7 55.45S	178 25 27.05E	2	29	14	-0.5	1.4
201	1718	64	65	N-W	18 7 57.44S	178 25 25.24E	2	34	13	1.3	3.3
201	1926	65	44	S-E	18 7 54.42S	178 25 26.04E	2	36	4	-1.9	-1.5
201	2114	65	22	S-W	18 7 55.80S	178 25 28.14E	2	24	5	-0.5	1.7
*201	2242	63	74	S-E	18 7 54.14S	178 25 12.65E	2	30	0	-2.1	-14.0
201	2308	54	23	S-W	18 7 55.50S	178 25 24.96E	2	22	6	-0.9	-1.7

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-4

ARITHMETIC MEAN SOLUTION AT SUVA ANT 75 METERS

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
19	9	10	18 7 56.27S 178 25 25.68E	1.0 1.7	0.3 0.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS		DEVIATION >10 SECS OF ARC
			<15	>75	
201	912	X		X	X
201	930	X			
201	1054		X		
201	1149	X		X	
201	1532	X			
202	2242				X
202	32	X		X	
202	322	X		X	
202	506		X		

TABLE 3C-4

BY INDIVIDUAL SATELLITE - ARITHMETIC MEAN SOLUTION AT SUVA ANT 75 METERS

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	4	18 7 56.71S 178 25 26.76E	0.8 1.0	0.4 0.5
54	2	18 7 56.16S 178 25 26.79E	0.7 1.7	0.5 1.2
64	1	18 7 56.44S 178 25 26.62E		
65	3	18 7 56.48S 178 25 26.80E	0.7 1.2	0.4 0.7

TABLE 3A-5  
P/V KANA KEOKI 1971 POSITIONAL DATA, SUVA, FIJI  
MOORED TO DOLPHINS AT N/E KING'S WHARF. ANTENNA HEIGHT 75 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)					
							IT	CTS	CTS0	LATITUDE	LONGITUDE	
202	2340	63	26	S-E	18 7 45.425	178 25 33.24E	2	28	12	-1.4	1.0	
*203	212	42	77	S-E	18 7 45.345	178 25 26.82E	2	34	17	-1.4	-5.5	
203	416	64	37	S-E	18 7 45.005	178 25 22.49E	2	31	15	-1.9	-0.6	
*203	502	42	6	S-E	18 7 45.545	178 25 29.24E	4	4	3	-1.2	-3.0	
203	604	64	21	S-E	18 7 45.655	178 25 32.58E	2	27	13	-1.1	2.3	
*203	752	65	76	S-E	18 7 47.645	178 25 24.65E	2	32	6	0.4	-7.3	
*203	P20	64	7	S-E	18 7 58.505	178 25 25.22E	3	0	0	11.7	-6.1	
*203	520	63	13	S-E	18 7 48.355	178 25 32.88E	2	22	2	1.5	-0.6	
*203	540	65	45	S-E	18 7 42.805	178 25 25.40E	5	0	0	-6.0	-2.4	
*203	1002	64	77	S-E	18 7 46.180	178 25 24.45E	3	32	11	0.2	13.4	
203	1030	63	53	S-E	18 7 46.180	178 25 22.40E	2	22	17	1.4	-0.4	
203	1434	64	34	N-E	18 7 47.525	178 25 32.44E	2	32	14	0.7	-1.3	
203	1542	64	18	N-E	18 7 49.185	178 25 29.14E	2	26	12	1.4	-0.2	
203	1622	42	22	N-E	18 7 47.105	178 25 33.24E	2	22	13	0.3	0.5	
203	1726	64	44	N-E	18 7 47.585	178 25 33.24E	2	34	17	0.3	1.0	
*203	2126	65	64	S-E	18 7 46.345	178 25 34.56E	2	16	5	-1.4	-3.0	
*203	2124	64	42	S-E	18 7 48.625	178 25 33.00E	2	15	0	1.9	0.7	
203	2252	63	69	S-E	18 7 44.825	178 25 34.44E	2	32	1	-2.0	2.2	
203	2312	64	17	S-E	18 7 47.045	178 25 22.76E	2	25	11	0.2	0.5	
224	220	42	25	S-E	18 7 45.185	178 25 32.00E	2	29	8	-1.6	0.7	
*224	310	64	13	S-E	18 7 46.865	178 25 31.65E	2	17	1	0.1	1.4	
*224	406	42	32	S-E	18 7 44.525	178 25 32.46E	2	30	14	-2.3	0.2	
204	514	64	57	S-E	18 7 45.705	178 25 33.36E	2	35	16	-1.0	1.1	
204	704	65	28	S-E	18 7 46.945	178 25 30.60E	2	28	13	0.2	-1.4	
204	850	75	25	N-E	18 7 46.385	178 25 32.69E	2	27	12	-0.4	0.6	
204	912	64	34	S-E	18 7 44.645	178 25 32.84E	2	31	15	-2.2	0.3	
204	1016	63	57	N-E	18 7 48.495	178 25 26.78E	2	32	13	1.7	-1.5	
204	1100	64	23	S-E	18 7 45.965	178 25 31.19E	2	23	9	-0.8	-0.2	
*204	1204	63	12	S-E	18 7 45.005	178 25 32.10E	2	20	9	-1.8	-0.2	
*204	1242	42	9	S-E	18 7 42.765	178 25 31.56E	3	12	5	-3.0	-0.7	
204	1526	42	72	N-E	18 7 48.005	178 25 37.26E	2	35	17	1.2	-0.6	
204	1636	64	72	N-E	18 7 47.405	178 25 26.72E	2	36	17	0.6	-3.7	
*204	1726	64	10	N-E	18 7 47.285	178 25 21.38E	6	14	7	-0.5	-0.0	
204	1850	65	26	S-E	18 7 45.125	178 25 30.78E	2	33	15	-1.7	-1.6	
204	2036	64	17	N-E	18 7 48.195	178 25 31.22E	2	20	9	1.4	-1.3	
204	2224	63	44	S-E	18 7 45.005	178 25 31.02E	2	21	16	-1.8	-1.3	
204	2224	64	42	N-E	18 7 48.925	178 25 33.42E	2	28	12	2.1	-1.1	
204	2350	63	17	S-E	18 7 44.825	178 25 22.82E	2	22	9	-2.0	-0.1	
*205	128	42	7	S-E	18 7 53.345	178 25 34.55E	2	0	0	4.5	2.3	
*205	310	42	76	S-E	18 7 44.405	178 25 22.52E	3	31	1	-2.4	-3.5	
205	424	64	56	S-E	18 7 45.905	178 25 32.52E	2	24	10	-0.3	-1.3	
*205	600	42	5	S-E	18 7 41.195	178 25 31.02E	6	0	6	4.4	-1.3	
*205	614	64	14	S-E	18 7 44.945	178 25 31.48E	2	21	10	-1.9	-0.6	
205	E02	65	69	N-E	18 7 46.925	178 25 37.74E	2	32	15	0.1	5.5	

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3A-5  
P/V KANA KEOKI 1971 POSITIONAL DATA, SUVA, FIJI  
MOORED TO DOLPHINS AT N/E KING'S WHARF. ANTENNA HEIGHT 75 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)					
							IT	CTS	CTS0	LATITUDE	LONGITUDE	
205	E22	54	11	S-E	18 7 47.295	178 25 34.68E	2	16	7	0.5	1.0	
205	G29	63	21	N-E	18 7 48.485	178 25 31.62E	2	24	12	1.7	-0.4	
205	1006	54	65	S-E	18 7 45.955	178 25 33.24E	2	35	16	-0.9	1.1	
205	1114	63	37	N-E	18 7 48.005	178 25 33.75E	2	33	16	1.2	-1.1	
205	1412	42	37	N-E	18 7 48.245	178 25 30.49E	2	33	15	1.4	-1.9	
205	1550	64	28	N-E	18 7 49.465	178 25 31.96E	2	31	14	3.1	-0.7	
205	1619	42	21	N-E	18 7 47.345	178 25 32.32E	2	26	12	0.5	0.7	
205	1737	64	30	S-E	18 7 47.345	178 25 32.32E	2	31	15	0.5	1.0	
*205	1824	65	6	S-E	18 7 45.785	178 25 32.12E	6	10	4	-1.0	0.4	
*205	1948	65	71	S-E	18 7 45.725	178 25 29.74E	7	32	3	-0.7	11.5	
205	2115	63	16	S-E	18 7 46.005	178 25 33.24E	2	22	9	-0.7	1.0	
205	2134	54	64	N-E	18 7 47.825	178 25 30.24E	2	25	0	1.0	-2.0	
205	2370	53	48	S-E	18 7 46.265	178 25 33.34E	2	32	12	-0.5	1.1	
*205	2320	54	12	N-E	18 7 46.045	178 25 31.26E	2	17	0	-0.7	-1.0	
205	216	42	27	S-E	18 7 44.465	178 25 32.14E	2	30	14	-2.3	0.1	
205	238	64	21	S-E	18 7 46.565	178 25 42.22E	2	24	4	-0.2	-0.1	
205	402	42	29	S-E	18 7 44.465	178 25 32.74E	2	31	14	-0.3	1.0	
205	524	64	39	S-E	18 7 46.425	178 25 34.02E	2	32	16	1.0	-0.7	
205	714	65	42	N-E	18 7 46.675	178 25 40.12E	2	31	16	-0.2	-0.4	
205	902	65	15	N-E	18 7 46.345	178 25 31.02E	2	22	10	-0.4	-0.5	
205	918	64	45	S-E	18 7 46.345	178 25 22.74E	2	27	11	-0.4	0.5	
205	1024	63	74	N-E	18 7 47.195	178 25 24.56E	2	31	0	1.4	-7.3	
207	612	65	46	N-E	18 7 47.105	178 25 33.65E	2	30	11	0.3	1.4	
207	636	63	30	N-E	18 7 47.285	178 25 31.92E	2	27	11	0.6	-0.6	
207	1012	64	50	S-E	18 7 47.105	178 25 32.22E	2	30	14	0.3	-0.1	
207	1122	63	26	N-E	18 7 46.525	178 25 32.22E	2	29	14	-0.3	-0.1	
207	1429	42	41	N-E	18 7 47.725	178 25 30.79E	2	33	15	0.3	-1.5	
207	1600	64	41	N-E	18 7 48.195	178 25 33.70E	2	32	4	1.4	-1.7	
207	1620	42	19	N-E	18 7 48.425	178 25 32.12E	2	16	5	1.6	-0.2	
207	1746	64	20	N-E	18 7 47.105	178 25 33.12E	2	27	12	0.3	-0.8	
207	1958	65	64	S-E	18 7 46.325	178 25 36.14E	2	38	17	-0.5	3.9	

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 3B-5  
ARITHMETIC MEAN SOLUTION AT SUVA ANT 75 METERS

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
77	21	56	18 7 46.75S 178 25 32.27E	1.3 1.9	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS <15 >75	DEVIATION >5	DEVIATION >10 SECS OF ARC
203	312		X		
203	502		X		
203	752		X		
203	820		X		X
203	900		X		
203	940		X		
203	1002		X	X	X
203	2129		X		
204	130		X		
204	1204		X		
204	1342		X		
204	1826		X		X
205	128		X		
205	310		X		
205	500		X		
205	614		X		
205	822		X		
205	1804		X		X
205	1948		X		X
205	2320		X		
207	1814		X		

TABLE 3C-5  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT SUVA ANT 75 METERS

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	11	18 7 46.67S 178 25 32.59E	1.6 1.9	0.5
54	10	18 7 46.45S 178 25 32.63E	1.6 1.9	0.5 0.6
63	13	18 7 46.82S 178 25 32.63E	1.6 1.7	0.4 0.5
64	13	18 7 46.82S 178 25 32.63E	1.6 1.7	0.4 0.5
65	9	18 7 46.31S 178 25 32.81E	1.6 1.9	0.5 0.6

TABLE 3A-6  
R/V KANA KEKI 1971 POSITIONAL DATA, SUVA, FIJI  
MOORED TO DOLPHINS AT N/E KING'S WHARF\*, ANTENNA HEIGHT 54 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
207	2124	63	24	S-E	18 7 45.785	178 25 32.24E	2	26	13	-1.0	0.1
207	2210	63	33	S-W	18 7 45.905	178 25 32.22E	2	29	7	-0.8	0.0
208	212	42	30	S-E	18 7 44.265	178 25 32.24E	2	28	12	-2.5	0.7
208	240	64	31	S-E	18 7 45.785	178 25 32.24E	2	28	6	-1.0	0.7
208	514	64	26	S-W	18 7 45.245	178 25 31.62E	2	29	13	-1.5	-0.4
208	724	65	64	N-E	18 7 47.145	178 25 30.40E	2	32	15	0.6	-2.3
*208	550	63	6	N-E	18 7 48.045	178 25 30.16E	7	14	6	21.1	-1.1
*208	514	65	9	N-W	18 7 40.425	178 25 31.26E	2	12	5	-2.1	-0.9
208	132	63	70	N-W	18 7 49.665	178 25 33.24E	2	34	17	1.0	-1.0
*208	110P	54	12	S-W	18 7 46.695	178 25 32.04E	2	19	6	-0.1	-1.6
*208	133P	42	12	N-E	18 7 49.675	178 25 32.04E	2	19	4	1.0	0.7
*208	1512	64	15	N-E	18 7 46.145	178 25 31.00E	2	22	10	-0.6	-0.4
209	1556	64	52	N-W	18 7 48.075	178 25 32.22E	2	33	1	1.3	0.6
209	1910	65	54	S-E	18 7 46.605	178 25 31.02E	2	33	1	-1.1	-1.2
209	2402	54	30	N-E	18 7 47.525	178 25 31.02E	2	32	15	0.9	-0.3
*208	2102	65	17	S-E	18 7 46.565	178 25 31.44E	2	17	7	-0.2	-0.9
*208	2220	63	12	S-E	18 7 49.025	178 26 0.40E	17	13	0	2.3	32.0
208	2234	54	28	N-E	18 7 47.205	178 25 32.10E	2	20	6	0.5	-2.1
*209	10	63	7	S-W	18 7 48.305	178 26 22.24E	4	6	0	2.2	-2.0
*209	122	42	8	S-E	18 7 51.525	178 26 21.00E	4	7	4	6.8	-1.6
*209	130	64	12	S-E	18 7 46.425	178 26 23.40E	6	6	0	-1.3	2.0
209	44	64	70	S-W	18 7 46.425	178 26 23.74E	3	32	1	-1.1	3.1
209	64	65	23	N-E	18 7 47.525	178 26 31.64E	2	26	12	0.4	-0.5
209	622	65	30	N-W	18 7 46.565	178 26 33.02E	2	22	10	-0.2	1.5
209	644	65	46	S-E	18 7 46.565	178 26 31.02E	2	22	10	1.6	-0.1
209	1114	64	38	S-W	18 7 46.565	178 26 32.04E	2	22	13	1.6	-0.0
209	1132	63	18	S-W	18 7 46.025	178 26 32.04E	2	22	14	0.2	0.9
209	1124	62	45	N-E	18 7 47.405	178 26 31.64E	2	22	13	0.7	-1.6
*209	1606	63	60	N-E	18 7 48.325	178 26 30.70E	2	31	1	1.7	-1.4
*209	1756	63	13	N-W	18 7 46.765	178 26 32.70E	2	16	2	-1.1	0.6
*209	1922	65	22	S-E	18 7 45.165	178 26 32.04E	2	22	14	-1.1	-0.2
*209	1644	64	6	N-E	18 7 46.425	178 26 31.42E	6	12	5	-2.3	0.3
209	2010	65	45	S-E	18 7 46.025	178 26 33.12E	2	34	16	0.7	0.6
209	2132	63	34	S-E	18 7 45.195	178 26 32.76E	2	32	15	-1.6	0.6
209	2118	63	22	S-W	18 7 46.425	178 26 33.00E	2	26	7	-1.3	0.4
210	22P	42	33	S-E	18 7 45.005	178 25 32.10E	2	31	15	-1.7	-0.1
210	544	64	19	S-W	18 7 45.975	178 26 21.26E	4	22	3	-0.4	-0.4
*210	734	65	66	N-W	18 7 46.145	178 26 45.30E	2	29	0	-0.6	13.1
210	656	63	16	N-E	18 7 48.005	178 25 33.42E	2	15	1	1.3	1.2
210	624	64	73	S-E	18 7 46.205	178 25 34.00E	2	27	1	-0.5	2.0
210	1042	61	49	N-W	18 7 48.245	178 25 31.02E	2	32	14	1.5	-0.1
*210	1112	54	8	S-W	18 7 50.645	178 24 32.22E	P	0	0	3.9	0.0
*210	1230	42	14	N-E	18 7 45.245	178 25 33.00E	2	21	10	-1.5	1.7
210	1516	42	54	N-W	18 7 48.365	178 25 33.66E	2	29	8	1.6	1.5
210	1706	64	36	N-W	18 7 47.585	178 25 33.12E	2	33	16	0.8	0.0

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3A-6  
R/V KANA KEKI 1971 POSITIONAL DATA, SUVA, FIJI  
MOORED TO DOLPHINS AT N/E KING'S WHARF\*, ANTENNA HEIGHT 54 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
210	1520	65	73	S-E	18 7 45.425	178 26 26.74E	3	35	0	-1.3	-3.5
*210	2046	63	11	S-E	18 7 46.985	178 26 33.78E	2	18	0	0.2	1.6
*210	2110	65	11	S-W	18 7 44.405	178 26 31.14E	2	15	7	-2.3	-1.1
*211	116	42	6	S-E	18 7 46.505	178 26 35.84E	6	11	4	-0.2	3.7
211	300	42	73	S-W	18 7 45.605	178 25 34.02E	2	13	1	-1.1	1.4
211	454	63	48	S-W	18 7 45.305	178 25 32.22E	2	35	17	-0.2	0.0
211	646	65	34	N-F	18 7 47.405	178 26 31.02E	2	29	13	0.3	-0.2
211	622	64	26	S-E	18 7 45.005	178 26 31.54E	2	19	12	-2.2	-0.4
211	652	63	64	N-F	18 7 44.005	178 26 31.50E	2	24	16	-0.5	1.4
*211	1118	64	29	N-W	18 7 46.265	178 26 31.52E	2	24	10	-0.5	1.0
211	1140	63	11	N-W	18 7 43.765	178 26 31.52E	2	24	16	-0.5	1.3
211	1420	42	50	N-E	18 7 46.195	178 26 31.52E	2	23	16	-0.5	1.3
*211	1625	62	52	N-F	18 7 46.045	178 26 31.52E	2	23	11	-0.6	-2.4
*211	1452	65	37	S-E	18 7 45.245	178 26 30.54E	6	10	3	-1.5	-0.1
*211	1622	65	32	S-E	18 7 46.445	178 26 32.10E	2	34	16	-2.1	-0.1
*211	1424	64	13	N-E	18 7 47.165	178 26 32.00E	2	20	3	0.4	0.6
*211	2018	65	31	S-W	18 7 48.765	178 26 34.02E	2	35	17	-1.0	1.8
211	2142	64	59	N-W	18 7 48.705	178 26 32.24E	2	18	0	2.2	1.0
*212	206	42	37	S-E	18 7 45.245	178 26 32.44E	6	0	0	-1.5	-0.1
212	252	42	21	S-W	18 7 44.765	178 26 32.10E	2	27	13	-2.0	-0.1
212	412	63	66	S-E	18 7 46.285	178 26 32.84E	2	19	8	0.2	0.0
*212	654	61	11	S-E	18 7 46.225	178 26 31.34E	2	17	8	0.2	-0.4
212	644	63	24	N-E	18 7 48.195	178 26 32.34E	2	29	14	1.4	0.1
212	630	64	71	S-W	18 7 45.195	178 26 34.17E	2	23	1	-1.6	-0.1
*212	1050	63	34	N-W	18 7 46.865	178 26 33.74E	2	30	14	0.1	-1.8
*212	1113	64	7	S-E	18 7 43.665	178 26 33.64E	3	0	0	2.0	4.6
212	1320	42	16	N-F	18 7 54.365	178 26 31.52E	2	22	10	7.6	-0.1
212	1512	42	49	N-W	18 7 44.125	178 26 32.84E	2	33	16	1.6	0.4
212	1532	64	33	N-E	18 7 47.105	178 25 32.34E	2	30	16	0.4	0.1
212	1716	64	25	N-W	18 7 46.205	178 25 32.54E	2	24	11	-0.5	0.4
*212	1746	65	11	S-E	18 7 44.545	178 26 33.24E	2	19	3	-2.1	1.0
*212	1530	65	74	S-E	18 7 45.545	178 26 35.94E	2	30	16	-1.2	3.7
212	2050	64	35	N-E	18 7 44.125	178 26 31.04E	2	15	0	-0.4	-0.4
*213	112	42	23	S-E	18 7 47.225	178 26 32.84E	6	14	7	2.6	2.7
213	256	42	67	S-E	18 7 45.845	178 26 34.04E	2	34	14	-0.6	1.2
213	218	64	25	S-E	18 7 46.385	178 26 32.74E	2	28	14	-0.4	0.6
213	656	64	32	N-E	18 7 45.545	178 26 32.04E	2	32	15	-0.6	0.0
*213	634	64	52	N-E	18 7 47.705	178 26 32.04E	2	21	14	1.0	-2.1
*213	614	61	7	N-E	18 7 42.245	178 26 34.54E	2	31	14	2.5	3.7
*213	1022	61	73	N-E	18 7 45.565	178 26 34.74E	15	0	0	-1.6	0.5
*213	1026	64	22	S-E	18 7 47.345	178 26 31.56E	2	20	9	0.6	-0.5
*213	1153	63	7	N-W	18 7 45.125	178 26 32.44E	2	0	0	-1.0	4.7
*213	1416	62	56	N-E	18 7 47.425	178 26 31.55E	2	33	14	0.0	-0.5
*213	1444	64	11	N-E	18 7 49.025	178 26 33.04E	2	17	7	2.3	-0.2

TABLE 3A-6 (CONT.)

R/V KAKA KENKI 1571 POSITIONAL DATA, SUVA, FIJI  
MPCRED TO DOLPHINS AT N/E KING'S WHARF. ANTENNA HEIGHT 54 METERS.

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DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	C150	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
213	1606	42	14	N-E	18 7 45.905	178 25 32.10E	2	20	0	-0.8	-0.1
213	1628	64	65	N-W	18 7 48.245	178 25 33.36E	2	36	17	1.5	1.2
213	1842	65	46	S-E	18 7 44.245	178 25 34.90E	2	36	12	-2.1	-1.1
213	2000	54	19	N-E	18 7 48.665	178 25 32.10E	2	25	11	1.9	-0.1
213	2028	65	21	S-W	18 7 46.205	178 25 34.03E	2	24	12	-0.5	1.0
213	2144	54	45	N-W	18 7 49.485	178 25 32.34E	2	27	11	1.7	0.1
213	2236	63	5	S-W	18 7 50.765	178 25 32.10E	6	11	4	4.0	-0.1
214	202	42	40	S-E	18 7 45.125	178 25 32.70E	2	33	16	-1.6	0.6
214	232	64	7	S-E	18 7 52.225	178 25 34.74E	3	4	1	6.2	2.5
214	350	42	19	S-W	18 7 46.085	178 25 30.60E	2	26	12	-7.7	-1.3
214	414	64	68	S-W	18 7 45.745	178 25 32.24E	2	33	1	-0.0	3.1
214	608	65	1F	N-E	18 7 47.045	178 25 31.69E	2	23	10	7.3	-0.1
214	746	54	12	S-E	18 7 42.595	178 25 36.54E	2	19	9	-4.1	3.7
214	912	63	34	N-E	18 7 47.105	178 25 33.12E	2	30	11	0.4	9.0
214	932	54	42	S-W	18 7 45.775	178 25 31.47E	2	30	8	-1.7	-1.1
214	1102	63	24	N-W	18 7 46.285	178 25 31.48E	2	28	13	-0.7	-0.5
214	1324	42	17	N-E	18 7 47.525	178 25 32.64E	2	24	2	0.8	0.4
214	1500	45	45	N-E	18 7 47.445	178 25 32.64E	2	34	16	1.5	0.2
214	1540	64	49	N-E	18 7 47.185	178 25 31.80E	2	35	15	0.6	-0.4
214	1726	64	1F	N-W	18 7 45.765	178 25 31.62E	2	24	11	-1.1	-0.1
214	1756	65	18	S-E	18 7 45.125	178 25 33.01E	2	27	12	-1.6	0.4
214	1940	65	62	S-W	18 7 46.485	178 25 34.04E	2	30	10	-0.3	1.0
214	2024	64	67	N-E	18 7 48.605	178 25 29.54E	2	34	15	1.3	-2.1

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-6  
ARITHMETIC MEAN SOLUTION AT SUVA ANT 54 METERS

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
114	33	81	18 7 46.745 178 25 32.20E	1.5 1.5	0.2 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS <15 >75	ITERATIONS >5	ITERATIONS >10 SECS OF ARC
208	850	X		X	X
208	914	X			
208	1108	X			
208	1336	X			
208	2230	X			
209	10	X		X	X
209	122	X		X	
209	300	X		X	
209	1756	X			
209	1954	X		X	
210	734				X
210	1112	X		X	
210	1330	X			
210	2046	X			
210	2110	X			
211	116	X		X	
211	1140	X		X	
211	1423			X	
211	1803	X		X	
211	1924	X			
212	226			X	
212	664	X			
212	1114	X			X
212	1746	X			
213	112			X	
213	619	X			
213	1002			X	
213	1150	X			
213	144	X			
213	1626	X			
213	2331	X		X	
213	212	X			
214	748	X			

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TABLE 3C-6

BY INDIVIDUAL SATELLITE - ARITHMETIC MEAN SOLUTION AT SUVA ANT 54 METERS						
SATELLITE NUMBER	NSD	LATITUDE	LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)	
42	16	18 7 46.975	178 25 32.46E	2.4	0.8	0.5
54	15	18 7 46.885	178 25 32.44E	2.4	0.9	0.5
63	17	18 7 47.005	178 25 32.43E	2.3	0.8	0.6
64	15	18 7 46.885	178 25 32.44E	2.4	0.9	0.6
65	18	18 7 47.025	178 25 32.41E	2.2	0.8	0.5

TABLE 3A-7

R/V KANA KEOKI 1972 POSITIONAL DATA, SUVA, FIJI  
MOORED AT THE 500 FOOT MARK AT KING'S WHARF.

DAY	GMT	SAT	ELEV	CECM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)			
								CTS	CTSQ	LATITUDE	LONGITUDE
352	546	42	82	N-E	18 7 59.045	178 25 0.00E	12	0	0	-0.2	-24.4
*353	720	54	7	N-E	18 7 59.045	178 25 24.12E	11	0	0	-1.5	-1.2
*359	738	42	7	N-E	18 7 59.045	178 25 24.12E	10	0	0	0.7	-2.2
*360	604	44	68	N-W	18 7 59.465	178 25 48.64E	7	0	0	-0.5	22.8
*369	1054	53	7	N-E	18 7 59.465	178 25 20.59E	3	0	0	1.6	-4.7
369	1054	53	7	N-E	18 7 59.465	178 25 20.59E	2	30	4	-2.1	-0.1
369	1054	53	7	N-E	18 7 59.465	178 25 20.59E	1	23	1	0.0	-0.2
369	1339	63	200	N-W	18 7 59.745	178 25 26.04E	2	18	7	-2.8	1.7
*369	1600	64	13	S-E	18 7 57.125	178 25 26.12E	2	21	1	-0.2	2.3
*369	1736	42	64	S-E	18 7 59.745	178 25 27.60E	2	13	6	-6.3	-1.3
*369	1922	42	10	S-W	18 7 54.605	178 25 23.34E	2	13	0	1.7	-0.1
*369	2038	65	13	N-E	18 8 1.625	178 25 24.55E	2	13	0	-0.5	2.2
369	2054	64	68	S-E	18 7 59.405	178 25 27.44E	2	25	8	-0.2	1.5
369	2222	65	46	N-W	18 7 59.745	178 25 26.75E	2	31	15	-0.2	-1.5
369	2308	63	18	N-E	18 7 2.705	178 25 24.24E	2	23	2	2.8	-1.0
360	54	63	46	N-W	18 8 0.185	178 25 24.00E	2	33	10	0.3	-1.1
360	44	42	30	N-E	18 8 0.185	178 25 24.66E	2	31	15	0.3	-0.6
360	514	64	70	N-E	18 8 0.185	178 25 22.32E	2	22	16	0.6	-3.0
360	542	42	27	N-W	18 8 0.365	178 25 25.82E	2	30	14	0.4	0.3
*360	702	64	10	N-E	18 7 57.785	178 25 24.20E	3	11	15	-2.1	-1.0
360	814	34	18	N-E	18 8 0.645	178 25 24.54E	2	32	15	0.0	-0.7
360	1000	54	23	N-E	18 7 59.765	178 25 24.24E	2	25	0	-0.2	-1.0
*360	1156	63	12	S-E	18 8 0.425	178 25 25.62E	3	16	8	0.5	0.3
360	1240	63	57	S-W	18 8 0.065	178 25 25.62E	2	30	0	0.1	0.3
360	1640	42	21	S-E	18 7 59.225	178 25 25.62E	2	27	13	-0.7	9.3
360	1658	64	54	S-E	18 7 58.145	178 25 26.22E	2	32	15	-1.0	0.9

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-7  
ARITHMETIC MEAN SOLUTION AT SUVA, 500 FOOT MARK.

NE	N	NSD	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
			LONGITUDE	(SECONDS)	(SECONDS)
25	10	15	18 7 59.915	1.1	0.4
			178 25 25.28E		

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION >10 SEC'S OF ARC
			<15	>75	
350	548		X	X	X
350	720		X		
350	739		X		
350	904			X	X
350	1054		X		
369	1600		X		
369	1922		X		
369	2038		X		
360	702		X		
360	1056		X		

TABLE 3C-7

BY SATELLITE --- ARITHMETIC MEAN SOLUTION AT SUVA, 500 FOOT MARK.

SATELLITE NUMBER	NSD	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
		LONGITUDE	(SECONDS)	(SECONDS)
42	4	18 7 59.885	0.5	0.3
54	3	18 8 0.105	1.2	0.6
63	5	18 7 59.785	0.5	0.2
64	2	18 7 59.975	0.3	0.2
		178 25 26.13E	2.1	1.3

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TABLE 3A-8

R/V KANA KEOKI 1972 POSITIONAL DATA, SUVA, FIJI  
MOORED ALONGSIDE DOLPHINS AT THE GOVERNMENT SLIPWAY.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
360	1824	62	37	S-W	18 7 46.26S	178 26 32.34E	2	32	15	-0.4	-0.1
*360	1846	64	14	S-W	18 7 45.69S	178 25 31.44E	2	22	10	-1.0	-1.0
360	1855	64	25	S-E	18 7 45.34S	178 25 22.22E	2	25	14	-1.3	-0.2
360	2134	65	61	N-E	18 7 46.38S	178 26 29.62E	2	31	14	-0.3	-1.8
*360	2222	65	9	N-E	18 7 41.20S	178 25 31.34E	5	12	5	-3.4	-1.1
361	4	63	70	N-E	18 7 47.22S	178 26 30.12E	2	31	14	0.6	-2.3
*361	152	63	11	N-E	18 7 45.00S	178 26 30.06E	4	11	5	-1.6	-2.4
361	422	62	7	N-E	18 7 45.38S	178 26 27.64E	6	4	1	-21.3	-4.6
361	422	64	26	N-E	18 7 47.70S	178 26 31.94E	2	29	14	-1.1	-0.4
361	546	62	72	N-W	18 7 46.34S	178 26 40.16E	2	31	0	0.7	-1.1
361	626	64	31	N-E	18 7 47.38S	178 26 33.74E	2	31	0	0.6	-0.9
*361	724	64	10	N-E	18 7 46.66S	178 26 31.16E	2	34	1	2.0	-2.1
361	808	64	65	N-E	18 7 48.54S	178 26 33.78E	2	34	1	1.2	-1.1
361	1108	65	17	S-W	18 7 48.59S	178 26 31.16E	2	26	12	-0.1	-0.9
361	1162	63	53	S-E	18 7 46.10S	178 26 31.92E	2	33	15	-1.0	-0.5
*361	1340	63	13	S-W	18 7 46.09S	178 26 30.72E	2	17	9	-0.6	-1.7
361	1608	64	20	S-E	18 7 46.74S	178 26 32.54E	2	27	13	0.1	-1.1
361	1730	62	72	S-E	18 7 44.14S	178 26 32.42E	2	32	1	-0.5	1.0
361	1754	64	41	S-W	18 7 46.92S	178 26 32.44E	2	13	16	0.1	-0.1
*361	1718	62	9	S-W	18 7 49.90S	178 26 31.02E	4	11	6	2.3	-0.5
361	2048	65	21	N-E	18 7 47.22S	178 26 32.12E	2	25	12	0.6	-2.3
361	2232	65	31	N-W	18 7 46.30S	178 26 32.42E	2	26	11	-0.1	1.0
361	2216	63	26	N-E	18 7 46.84S	178 26 32.74E	2	30	14	-0.9	-1.1
362	102	63	32	N-W	18 7 44.20S	178 26 13.00E	2	32	15	-0.4	0.6
362	452	62	13	N-E	18 7 47.46S	178 26 12.22E	2	31	14	0.4	-0.2
*362	518	63	80	N-W	18 7 46.56S	178 26 12.14E	2	33	0	-0.1	3.7
362	438	62	25	N-W	18 7 46.20S	178 26 12.12E	2	28	14	-0.4	2.7
*362	706	64	7	N-W	18 7 39.50S	178 26 26.64E	6	0	0	-7.7	-5.4
362	P16	54	44	N-E	18 7 44.12S	178 26 30.72E	2	33	15	-1.5	-1.7
362	E36	65	20	S-E	18 7 47.12S	178 26 32.46E	2	25	12	-0.5	-0.2
362	1004	64	17	N-W	18 7 46.12S	178 26 32.42E	2	28	11	-0.3	-0.2
362	1022	55	46	S-E	18 7 42.20S	178 26 31.44E	2	29	13	-0.4	-1.9
362	1104	63	19	S-E	18 7 47.70S	178 26 32.22E	2	24	11	1.1	-1.2
362	1610	63	39	S-E	18 7 46.97S	178 26 32.34E	2	24	13	1.1	-0.1
362	1436	62	23	S-E	18 7 45.78S	178 26 32.14E	2	28	13	-0.3	-0.1
*362	1706	63	78	S-E	18 7 46.12S	178 26 32.76E	3	32	1	-0.3	0.3
362	1322	62	33	S-W	18 7 50.02S	178 26 32.10E	2	31	15	-0.6	-0.3
*362	1656	64	3	S-W	18 7 50.06S	178 26 31.56E	7	10	4	4.4	-2.0
362	2002	64	33	S-E	18 7 45.12S	178 26 31.56E	2	32	15	-1.5	-0.2
362	2144	65	82	N-W	18 7 44.82S	178 26 12.00E	6	28	1	-2.1	39.4

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-8

ARITHMETIC MEAN SOLUTION AT SUVA, AT DOLPHINS.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
40	12	28	18 7 46.65S 178 26 32.45E	0.9 1.9	0.2 0.4

ALL PROBLEM FIXES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>10 SECS OF ARC
360	1846	X		
360	2322	X		X
361	152	X		
361	402	X	X	X
361	724	X		
361	1340	X		
361	1019	X		
362	514	X		
362	708	X		X
362	1706	X		
362	1856	X		X
362	2144	X	X	X

TABLE 3C-8

BY SATELLITE --- ARITHMETIC MEAN SOLUTION AT SUVA, AT DOLPHINS.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	7	18 7 46.46S 178 26 33.72E	0.7 3.0	0.3 1.1
54	5	18 7 46.68S 178 26 34.32E	0.7 3.5	0.3 1.6
63	6	18 7 46.53S 178 26 34.69E	0.7 3.2	0.3 1.1
64	4	18 7 46.80S 178 26 34.62E	0.7 4.0	0.3 2.0
65	6	18 7 46.53S 178 26 33.99E	0.7 3.2	0.3 1.3

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TABLE 4A-1  
R/V MAHI 1970 POSITIONAL DATA, RABAUL, NEW BRITAIN  
MOORED AT DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
216	1400	54	14		4 11 58.145	152 10 14.76E	3	21	10	-3.3	-3.2
216	1522	42	56		4 12 0.545	152 10 19.92E	2	33	16	-0.9	1.0
*216	1710	42	11		4 12 3.245	152 10 14.52E	2	17	8	1.4	-3.5
216	1742	64	28		4 12 0.365	152 10 19.42E	2	22	29	1.2	0.4
216	1634	64	25		4 12 0.445	152 10 15.54E	2	22	30	15	-0.6
216	2344	54	27		4 12 2.105	152 10 20.16E	2	30	15	0.7	2.2
217	132	54	25		4 12 3.305	152 10 15.24E	2	28	13	1.9	-2.1

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 4B-1  
ARITHMETIC MEAN SOLUTION AT RABAUL

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
7	2	5	4 12 1.435 152 10 17.98E	1.2 2.2	0.6 1.0

ALL PROBLEM FIXES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS <15 >75	DEVIATION >5 >10 SECS OF ARC
216	1400	X		
216	1710	X		

TABLE 4C-1  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT RABAUL

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	4 12 0.545 152 10 19.92E		
54	2	4 12 1.325 152 10 20.04E	1.1 0.2	0.3 0.1
64	2	4 12 1.325 152 10 20.04E	1.1 0.2	0.9 0.1

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TABLE 5A-1  
R/V MAHI 1970 POSITIONAL DATA, GUAM, TRUST TERRITORY  
MOORED AT THE DILLINGHAM PIER

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
304	2256	64	19		13 27 45.39N	144 39 53.04E	2	24	5	2.7	0.4
305	228	65	22		13 27 39.56N	144 39 54.16E	2	25	11	-2.7	1.7
305	412	65	30		13 27 40.58N	144 39 52.44E	2	26	14	-1.7	-0.2
305	510	13	20		13 27 42.72N	144 39 56.17E	2	26	12	0.1	2.0
305	616	63	16		13 27 41.24N	144 39 52.78E	2	26	4	-0.7	0.1
305	716	54	56		13 27 44.22N	144 39 50.44E	2	23	7	1.7	-2.2
310	116	64	50		13 27 45.72N	144 39 52.00E	4	22	13	3.1	0.2
310	200	65	17		13 27 40.59N	144 39 54.62E	2	22	2	-2.0	1.6
*310	440	63	14		13 27 46.14N	144 39 54.74E	2	13	0	1.5	-17.2
*310	624	54	77		13 27 43.59N	144 39 51.74E	8	18	1	1.3	-43.0
310	524	42	31		13 27 42.06N	144 39 54.06E	2	31	14	-0.6	1.4
310	1110	42	23		13 27 41.19N	144 39 52.56E	2	24	4	-0.4	-0.1
310	1256	64	67		13 27 41.55N	144 39 51.00E	2	35	17	-1.1	-1.2
*310	1328	65	8		13 27 39.19N	144 39 53.04E	8	11	4	-3.5	0.4
310	1512	65	68		13 27 43.14N	144 39 48.44E	2	34	0	0.5	-4.1
*310	1628	63	7		13 27 39.12N	144 39 59.42E	13	0	0	-3.5	6.5
*310	1704	65	7		13 27 42.62N	144 39 52.10E	6	0	0	-23.0	0.2
*310	1542	63	7		13 27 39.98N	144 39 48.19E	3	0	0	-3.8	-4.4
*310	1556	54	11		13 27 41.70N	144 39 46.26E	3	18	8	-0.9	-3.4
*310	2050	42	14		13 27 46.20N	144 39 53.74E	2	20	2	3.5	0.7
310	2234	42	51		13 27 44.04N	144 39 52.44E	2	34	16	1.4	-0.2

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 5B-1  
ARITHMETIC MEAN SOLUTION AT GUAM

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
21	8	13	13 27 42.63N 144 39 52.61E	1.8 1.7	0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>10 SECS OF ARC
310	440			X
310	624		X	X
310	1328	X		X
310	1628	X		X
310	1724	X		X
310	1742	X		
310	1938	X		
310	2050	X		

TABLE 5C-1  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT GUAM

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	3	13 27 42.65N 144 39 54.00E	1.2 0.9	0.7 0.5
54	1	13 27 42.05N 144 39 54.00E		
63	2	13 27 41.57N 144 39 53.28E	0.1 1.0	0.1 0.7
64	3	13 27 42.65N 144 39 53.00E	1.2 0.9	0.7 0.5
65	4	13 27 43.05N 144 39 52.35E	1.3 1.3	0.6 0.7

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TABLE 5A-2  
R/V MAHI 1970 POSITIONAL DATA, GUAM, TRUST TERRITORY  
MOORED AT THE DILLINGHAM PIER

DAY	GMT	SAT	ELEV	GEON	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
261	722	65	20		13 27 46.74N	144 39 52.64E	3	26	14	-1.5	-0.5
261	900	63	68		13 27 43.02N	144 39 55.62E	3	31	0	0.8	2.4
*266	228	42	16		13 27 44.04N	144 39 52.80E	5	13	0	1.8	-0.4
266	304	44	35		13 27 44.28N	144 39 52.92E	22	33	15	2.1	-0.1
266	450	64	22		13 27 44.45N	144 39 51.75E	22	27	9	2.1	-1.4
266	510	65	39		13 27 40.74N	144 39 43.84E	2	35	17	-1.5	2.7
266	704	65	23		13 27 39.96N	144 39 52.44E	2	31	15	-2.2	-0.4

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 5B-2  
ARITHMETIC MEAN SOLUTION AT GUAM

INF	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
7	1	6	13 27 42.20N 144 39 53.22E	2.0 1.4	0.8 0.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>10 SEC'S OF ARC
266	228			X

TABLE 5C-2  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT GUAM

SATELLITE NUMBER	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
63	1	13 27 43.02N 144 39 55.62E		
64	2	13 27 43.45N 144 39 54.27E	0.9 1.9	1.3
65	3	13 27 43.92N 144 39 53.44E	0.8 2.0	0.5 1.1

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TABLE 6A-1  
R/V MAHT 1970 POSITIONAL DATA, MAJURO, MARSHALL ISLANDS  
MOORED AT THE "T" WHARF

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
278	2328	42	22		7 6 14.34N	171 22 9.18E	3	27	12	-4.6	-7.4
*279	1632	63	8		7 6 13.08N	171 22 17.58E	6	6	2	-6.0	1.0
279	1752	54	24		7 6 17.88N	171 22 15.44E	2	30	14	-1.1	2.0
279	1944	54	28		7 6 19.92N	171 22 17.64E	2	30	14	0.9	1.1
*279	2050	42	8		7 6 25.20N	171 22 23.16E	6	8	3	6.2	6.6
279	2232	42	71		7 6 23.42N	171 22 20.10E	2	35	17	6.0	3.5

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 6B-1  
ARITHMETIC MEAN SOLUTION AT MAJURO

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
6	2	4	7 6 19.99N 171 22 16.55E	4.0 5.0	2.0 2.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION >10 SEC'S OF ARC
			<15	>75	
279	1632	X		X	
279	2050	X		X	

TABLE 6C-1  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT MAJURO

SATELLITE NUMBER	NED	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	7 6 19.08N 171 22 14.64E	6.7 7.7	4.7 5.5
54	2	7 6 19.38N 171 22 14.54E	6.7 7.7	4.7 5.5

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TABLE 7A-1  
R/V KANA KEOKI 1971 POSITIONAL DATA, PONAPE, CAROLINE ISLANDS  
MOORED AT THE MAIN DOCK

DAY	GMT	SAT	ELEV	GEON	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)		
								CTS	CTS0	LATITUDE LONGITUDE
146	428	54	25	N-W	6 58 43.26N	158 12 0.54E	2	0	0	-1.5 -1.4
146	500	63	20	S-W	6 58 45.90N	158 12 1.20E	2	0	0	1.2 -1.8
146	510	42	35	S-W	6 58 45.06N	158 12 3.12E	2	0	0	0.3 1.2
147	206	65	22	S-W	6 58 43.52N	158 12 2.76E	2	0	0	-2.8 0.8
147	226	63	11	S-E	6 58 47.45N	158 12 4.05E	2	0	0	2.7 2.5
147	234	54	72	N-W	6 58 44.40N	158 12 5.45E	2	0	0	-0.3 1.0
147	410	63	54	S-W	6 58 46.58N	158 12 5.35E	30	0	0	1.2 1.3
147	1022	64	60	S-W	6 58 45.36N	158 12 5.00E	2	22	0	0.4 1.0
147	1208	65	52	N-E	6 58 43.32N	158 12 5.25E	2	24	16	-1.1 -1.2
147	1354	65	29	N-W	6 58 44.34N	158 12 5.45E	2	23	16	-0.4 1.2
147	1401	63	10	N-E	6 58 43.34N	158 12 5.25E	3	15	7	0.6 -1.7
147	1506	64	78	S-E	6 58 46.72N	158 12 5.25E	2	34	18	1.0 -2.7
147	1520	63	60	N-W	6 58 45.10N	158 12 5.12E	2	32	1	0.5 1.2
147	1556	64	7	S-E	6 58 46.56N	158 12 5.61E	2	30	0	4.2 -3.9
147	1558	64	42	N-E	6 58 46.40N	158 12 5.25E	2	33	16	-1.3 0.6
147	2020	64	7	N-E	6 58 46.40N	158 12 5.45E	5	0	0	30.4 -7.3
147	2142	62	13	N-W	6 58 52.78N	158 12 6.75E	3	11	2	7.3 5.7
147	2202	64	63	N-E	6 58 50.40N	158 12 6.15E	12	0	0	6.7 77.2
147	2244	65	13	S-E	6 58 47.40N	158 12 6.10E	4	16	8	2.7 0.1
148	128	65	43	S-W	6 58 45.48N	158 12 3.05E	2	23	14	-2.7 1.0
148	248	64	49	N-E	6 58 44.34N	158 12 2.25E	2	34	14	-0.4 0.2
148	330	63	73	S-E	6 58 45.36N	158 12 2.05E	2	23	1	0.6 -1.1
148	438	64	13	N-W	6 58 40.02N	158 12 5.61E	2	17	6	-4.7 -2.4
148	520	63	7	S-W	6 58 50.24N	158 12 5.85E	7	6	2	6.2 -3.4
148	720	62	26	S-E	6 58 44.70N	158 12 2.25E	2	26	13	-0.0 0.2
148	904	62	24	S-W	6 58 45.30N	158 12 2.25E	2	26	12	0.6 0.2
148	932	64	45	S-E	6 58 45.54N	158 12 1.20E	2	33	4	0.9 -0.8
148	1206	65	70	N-W	6 58 44.88N	158 12 5.45E	6	35	3	0.1 3.1
148	1418	64	27	S-E	6 58 45.84N	158 12 1.44E	2	30	14	1.1 -0.5
148	1512	63	49	N-E	6 58 45.00N	158 12 1.58E	2	33	16	0.1 0.2
148	1554	64	27	S-W	6 58 45.00N	158 12 1.58E	2	30	14	0.1 -0.1
148	1702	63	13	N-W	6 58 45.62N	158 12 3.12E	2	16	7	1.0 1.2
149	1856	62	14	N-E	6 58 42.78N	158 12 2.45E	2	21	3	-2.0 0.5
149	2042	62	46	N-W	6 58 45.10N	158 12 2.55E	2	29	14	0.4 0.5
149	2114	64	32	N-E	6 58 45.28N	158 12 2.76E	2	30	11	-1.5 0.8
149	2206	64	42	N-W	6 58 42.54N	158 12 0.24E	2	17	4	-2.2 -1.7
149	28	65	61	S-E	6 58 45.96N	158 12 5.83E	2	0	0	1.2 -3.5
149	54	64	14	N-E	6 58 43.84N	158 12 1.58E	2	0	0	-0.9 0.0
149	226	65	7	S-W	6 58 44.18N	158 12 5.74E	6	0	0	3.4 -4.1

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 7B-1  
ARITHMETIC MEAN SOLUTION AT PONAPE MAIN DOCK

NF	N	ASC	LATITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
39	15	24	6 58 44.74N 158 12 1.57E	0.6 1.2	0.2 0.2

ALL PROBLEM PASSES APC LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
147	226	X	X	
147	410		X	
147	1416	X		
147	1509		X	
147	1458	X	X	
147	2200	X	X	
147	2142	X	X	X
147	2222		X	X
147	2344	X		
148	434	X		
148	520	X		X
148	1306			
148	1702	X		
148	1854	X		
149	225	X		

TABLE 7C-1  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT PONAPE

SATELLITE	NSD	LATITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	6 58 44.93N 158 12 2.59E	0.4 0.4	0.2 0.2
54	6	6 58 44.65N 158 12 2.25E	0.4 0.9	0.3 0.4
63	4	6 58 44.86N 158 12 2.61E	0.4 0.5	0.2 0.2
64	4	6 58 44.86N 158 12 2.61E	0.4 0.5	0.2 0.2
65	6	6 58 44.65N 158 12 2.25E	0.8 0.9	0.3 0.4

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TABLE 8A-1

R/V KANA KEOKI 1971 POSITIONAL DATA, PALAU, CAROLINE ISLANDS  
MOORED AT THE MAIN DOCK ON MALAKAL ISLAND

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)		
										LATITUDE	LONGITUDE	IT
167	400	63	67	S-E	7 19 47.16N	134 27 51.79E	6	0	0	-2.2	24.1	
167	422	54	29	N-E	7 19 49.42N	134 27 23.64E	2	26	12	-0.3	2.1	
167	740	42	25	S-E	7 19 49.50N	134 27 22.56E	2	20	7	0.2	-2.6	
167	526	42	29	S-E	7 19 50.28N	134 27 25.20E	2	29	9	0.9	1.7	
167	1010	64	71	S-E	7 19 50.70N	134 27 16.92E	3	31	0	1.4	-2.4	
*167	1202	64	7	S-E	7 19 56.24N	134 27 22.20E	5	0	0	-13.1	-1.3	
167	1250	65	42	N-E	7 19 48.12N	134 27 24.54E	2	35	16	-1.2	1.0	
167	1540	63	62	N-E	7 19 48.96N	134 27 21.54E	2	31	1	-0.4	-2.0	
*167	1730	63	5	N-E	7 19 46.02N	134 27 22.62E	5	11	5	-3.3	-0.2	
*167	1918	42	14	N-E	7 19 48.24N	134 27 24.14E	2	21	0	-1.1	0.7	
167	2102	42	46	N-E	7 19 49.20N	134 27 25.34E	2	31	15	-0.1	1.6	
167	2150	64	51	N-E	7 19 48.30N	134 27 24.04E	2	22	11	-1.0	-0.6	
168	120	65	74	S-E	7 19 50.24N	134 27 26.04E	2	23	16	0.7	2.6	
168	212	63	36	S-E	7 19 49.50N	134 27 23.24E	2	28	0	0.2	-0.2	
*168	232	64	23	N-E	7 19 49.36N	134 27 22.44E	2	25	0	-1.0	-0.4	
168	500	63	22	S-E	7 19 50.88N	134 27 22.82E	2	25	0	1.2	-0.4	
*168	630	64	22	S-E	7 19 51.60N	134 27 22.84E	2	23	22	2.5	-17.4	
168	722	72	72	S-E	7 19 49.86N	134 27 23.44E	2	26	2	2.2	-0.1	
168	1110	64	26	S-E	7 19 49.54N	134 27 23.22E	2	29	14	2.6	-2.1	
*168	1300	65	74	N-E	7 19 49.36N	134 27 16.24E	2	35	16	-1.0	-5.1	
168	1450	65	6	N-E	7 19 49.12N	134 27 16.24E	2	32	0	-4.2	3.0	
168	1640	63	31	N-E	7 19 48.36N	134 27 24.64E	2	26	12	-1.0	1.5	
168	2006	42	56	N-E	7 19 48.90N	134 27 24.64E	2	33	1	-0.4	-1.4	
168	2104	64	19	N-E	7 19 47.22N	134 27 23.12E	2	25	11	-2.1	-0.3	
*168	2156	42	11	N-E	7 19 49.13N	134 27 24.72E	6	17	7	-1.2	1.2	
168	2248P	64	40	N-E	7 19 49.50N	134 27 25.20E	2	31	16	0.2	1.7	
169	32	65	38	S-E	7 19 49.14N	134 27 22.94E	2	31	15	-0.2	-2.5	
169	220	65	16	S-E	7 19 51.24N	134 27 22.66E	2	18	7	-1.9	-2.0	
169	216	54	34	N-E	7 19 47.70N	134 27 24.14E	2	31	15	-1.6	0.7	
169	410	43	61	S-E	7 19 49.38N	134 27 25.34E	2	37	17	0.2	-1.3	
169	736	42	28	S-E	7 19 49.02N	134 27 23.22E	2	28	8	-0.3	-0.3	
*169	P1P	64	9	S-E	7 19 46.54N	134 27 23.04E	2	4	3	-2.7	0.4	
169	1020	64	72	S-E	7 19 49.14N	134 27 24.64E	2	35	17	-0.2	1.7	
169	1214	64	24	N-E	7 19 48.44N	134 27 23.24E	2	32	14	-0.9	-0.2	
169	1400	65	28	N-W	7 19 47.76N	134 27 24.64E	2	29	11	-1.6	0.5	
*169	1550	63	61	N-E	7 20 12.95N	134 32 24.96E	11	26	2	21.6	301.5	
169	1914	42	16	N-E	7 19 48.36N	134 27 23.64E	2	21	11	-1.0	0.1	
169	2058P	42	41	N-E	7 19 49.44N	134 27 25.04E	2	32	15	0.1	1.6	
*169	2200	64	76	S-E	7 19 49.66N	134 27 20.10E	2	35	17	-0.7	-3.4	
*169	2348	65	12	S-E	7 19 50.40N	134 27 25.20E	2	18	8	1.1	1.7	
170	132	65	48	S-E	7 19 50.40N	134 27 23.24E	2	32	15	1.1	-2.2	
*170	152	54	10	N-E	7 19 50.22N	134 27 23.40E	10	10	4	1.2	-2.1	
170	220	63	51	S-E	7 19 50.22N	134 27 23.24E	2	29	7	0.6	-0.2	
170	508	63	15	S-E	7 19 51.30N	134 27 23.64E	2	22	6	2.0	0.1	
*170	646	42	7	S-E	7 19 50.20N	134 27 23.24E	2	2	0	-15.1	-0.4	

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 8A-1

R/V KANA KEOKI 1971 POSITIONAL DATA, PALAU, CAROLINE ISLANDS  
MOORED AT THE MAIN DOCK ON MALAKAL ISLAND

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)		
										LATITUDE	LONGITUDE	IT
*170	826	42	69	S-E	7 19 48.42N	134 27 35.04E	2	33	1	-0.9	11.5	
170	932	64	42	S-E	7 19 49.32N	134 27 23.10E	2	27	10	-0.0	-2.4	
170	1125	64	17	S-E	7 19 48.62N	134 27 23.56E	2	23	0	0.3	-0.3	
170	1310	65	74	N-W	7 19 47.00N	134 27 27.18E	2	35	16	-0.7	3.7	
170	1502	54	56	S-E	7 19 48.00N	134 27 27.20E	2	27	16	0.5	-0.8	
*170	2034	62	66	N-E	7 19 48.72N	134 27 21.00E	5	32	15	-2.6	-1.4	
170	2112	64	28	N-E	7 19 49.74N	134 27 23.64E	2	31	15	2.4	0.1	
*170	2152	42	10	N-W	7 19 51.42N	134 27 26.16E	4	14	1	2.1	2.7	
170	2300	64	26	S-E	7 19 49.00N	134 27 24.04E	2	26	11	-2.3	0.1	
171	42	65	59	S-E	7 19 50.64N	134 27 22.00E	2	29	12	1.3	-1.7	

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 8B-1  
ARITHMETIC MEAN SOLUTION AT PALAU

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
55	18	37	7 19 49.34N 134 27 23.49E	1.0 1.7	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS >5	DEVIATION >10 SEC'S OF ARC
167	400		x	x
167	1202	x	x	x
167	1730	x		
167	1918	x		
168	332	x		
168	930		x	x
168	1300	x		
168	1450	x	x	
169	2156	x		
169	538	x		
169	1550		x	x
169	2200	x	x	
170	2348	x		
170	152	x	x	
170	646	x		x
170	824			x
170	2004		x	
170	2152	x		

TABLE 8C-1  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT PALAU

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	7	7 19 49.24N 134 27 23.86E	0.6 1.4	0.2 0.5
54	3	7 19 49.66N 134 27 24.48E	0.6 1.4	0.3 0.8
63	7	7 19 49.24N 134 27 23.86E	0.6 1.4	0.2 0.5
64	11	7 19 49.05N 134 27 23.10E	0.7 2.2	0.2 0.7
65	9	7 19 48.98N 134 27 23.87E	0.8 1.2	0.3 0.4

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TABLE 9A-1  
R/V KANA KEOKI 1971 POSITIONAL DATA, WELLINGTON, NEW ZEALAND  
MOORED TO THE EAST SIDE OF 'GLASCO' WHARF

107

DAY	GMT	SAT	ELFV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
241	1214	64	24	N-E	41 16 53.545	174 46 55.16E	2	27	4	-0.3	1.6
241	1500	64	56	N-W	41 16 53.525	174 46 56.44E	2	35	17	-0.7	-0.6
*241	1554	65	12	S-E	41 16 55.565	174 46 55.44E	2	38	4	1.4	2.1
*241	1718	54	7	N-E	41 16 55.105	174 47 58.22E	2	5	4	-1.9	11.1
*241	1740	64	46	S-E	41 16 54.225	174 47 52.04E	3	21	1	-1.9	-3.2
*241	1842	63	14	S-E	41 16 53.565	174 46 50.36E	2	20	9	-0.6	2.3
241	1900	54	55	N-E	41 16 54.465	174 46 58.54E	2	34	14	0.6	-1.1
*241	2026	63	72	S-W	41 16 52.025	174 46 34.44E	2	24	1	-2.2	-2.1
241	2048	64	22	N-E	41 16 54.425	174 46 57.54E	2	19	11	0.2	-0.6
*241	2116	63	13	S-W	41 16 53.645	174 46 54.35E	2	19	9	-1.2	-3.2
241	2338	42	19	S-E	41 16 55.005	174 46 57.54E	2	23	4	-0.2	2.1
242	1116	64	24	S-E	41 16 52.875	174 46 55.52E	2	30	14	-1.3	2.0
242	1202	64	56	S-W	41 16 54.425	174 46 57.00E	2	33	14	2.2	-2.5
242	1550	65	34	N-E	41 16 55.025	174 46 58.34E	2	31	14	0.6	0.4
*242	518	64	7	S-E	41 17 50.725	174 46 50.44E	2	5	2	15.5	3.3
242	636	65	13	N-W	41 16 54.425	174 46 57.42E	2	30	15	1.2	-0.1
242	700	64	55	S-E	41 16 52.685	174 46 57.84E	2	35	16	-1.2	0.3
242	734	63	42	N-E	41 16 54.565	174 46 58.32E	2	31	13	0.8	0.2
242	848	54	25	S-E	41 16 54.495	174 46 56.42E	2	30	15	0.3	-1.0
242	922	63	34	N-W	41 16 54.005	174 46 57.14E	2	31	14	-0.2	-2.4
*242	1228	64	10	S-E	41 16 58.325	174 47 0.14E	2	15	7	4.1	2.7
242	1412	64	68	N-E	41 16 54.125	174 46 56.42E	2	23	3	-0.1	2.0
242	1610	64	19	S-E	41 16 54.185	174 46 57.54E	2	26	12	-0.0	-0.2
242	1650	65	78	S-E	41 16 53.105	174 46 56.32E	2	31	14	-1.1	0.4
242	1810	54	26	N-E	41 16 54.005	174 46 56.42E	2	29	13	-0.2	1.1
242	1838	65	11	S-W	41 16 51.025	174 46 57.54E	2	29	14	-0.4	-0.6
242	1936	63	42	S-E	41 16 53.345	174 46 56.74E	2	24	9	-0.9	1.2
242	2156	54	50	N-W	41 16 54.345	174 46 56.75E	2	30	11	-0.2	-0.4
242	2126	63	30	S-W	41 16 51.705	174 46 57.14E	2	23	11	-0.5	-0.4
243	1230	42	64	N-W	41 16 54.425	174 46 56.42E	2	31	1	0.2	-0.7
*243	1558	42	0	N-W	41 17 15.005	174 47 23.34E	2	12	3	20.8	25.1
243	1604	65	17	S-E	41 16 59.465	174 46 50.24E	2	12	4	5.3	7.3
243	1720	54	10	N-E	41 16 55.925	174 46 58.20E	2	15	7	7.0	0.9
243	1750	65	70	S-W	41 16 54.065	174 46 57.54E	2	31	15	-1.1	2.3
243	1850	63	19	S-E	41 16 56.085	174 46 55.70E	2	21	10	0.0	2.2
243	1906	54	71	N-E	41 16 55.145	174 46 57.04E	2	32	15	-0.7	-1.5
243	2034	63	68	S-E	41 16 53.525	174 46 56.42E	2	22	15	-0.7	-1.2
243	2054	54	18	N-W	41 16 52.745	174 46 55.14E	2	32	11	-1.5	-2.0
*243	2334	42	21	S-E	41 18 3.005	174 46 37.44E	3	13	3	69.4	-80.1
244	1116	42	64	S-W	41 16 53.345	174 46 57.44E	3	26	2	-0.3	-0.6
244	1220	64	37	S-W	41 16 52.765	174 46 57.30E	2	21	0	-0.4	-0.2
244	1500	64	40	N-E	41 16 54.665	174 46 58.34E	2	23	16	0.5	0.8
*244	522	64	10	S-E	41 16 50.105	174 46 47.74E	2	13	4	6.1	-0.4
244	546	65	24	N-W	41 16 54.425	174 46 57.14E	2	27	13	0.2	-0.4
244	704	54	64	S-E	41 16 53.105	174 46 58.50E	3	37	17	-1.1	1.0

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 9A-1  
R/V KANA KEOKI 1971 POSITIONAL DATA, WELLINGTON, NEW ZEALAND  
MOORED TO THE EAST SIDE OF 'GLASCO' WHARF

DAY	GMT	SAT	ELFV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
244	744	63	55	N-E	41 16 54.495	174 46 56.98E	2	33	1	0.3	-0.7
244	E54	54	20	S-W	41 16 54.005	174 46 55.64E	2	26	13	-0.2	-1.0
244	E30	63	28	N-W	41 16 54.065	174 46 57.44E	2	29	11	-0.1	-0.0
244	1226	42	54	N-E	41 16 54.725	174 46 57.44E	2	35	15	0.5	-0.5
244	1412	42	25	N-W	41 16 53.825	174 46 57.72E	2	32	15	-0.3	-0.3
*244	1432	64	59	N-W	41 16 55.385	174 46 22.34E	4	15	1	-1.2	-3.2
*244	1518	65	7	S-E	41 16 46.555	174 47 6.18E	13	0	0	-7.5	8.6
*244	1610	64	14	N-E	41 16 55.265	174 46 58.98E	2	26	9	1.0	0.5
244	1700	65	53	S-E	41 16 54.005	174 46 57.18E	2	32	15	-0.2	-0.4
244	1814	54	32	N-E	41 16 54.425	174 46 58.22E	2	35	15	0.2	-0.2
244	1830	65	22	S-W	41 16 55.025	174 46 57.94E	2	26	15	0.0	-0.0
244	1844	54	43	S-E	41 16 53.625	174 46 48.90E	2	26	0	-0.6	0.4
244	2004	54	40	N-W	41 16 53.745	174 46 58.34E	2	26	11	-0.6	0.9

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 9B-1  
ARITHMETIC MEAN SOLUTION AT WELLINGTON

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
58	15	43	41 16 54.19S 174 46 57.55E	1.0 1.6	0.2 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>74	>5 >10 SECs OF ARC
241	1554	X		
241	1715	X		X
241	1740			X
241	1842	X		
241	2026			X
241	2215	X		
242	518	X	X	X
242	1228	X		
243	1258	X		X
243	1720	X	X	X
243	2134			X
244	522	X		X
244	1510			X
244	1518	X	X	
244	1610	X		

TABLE 9C-1  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT WELLINGTON

SATELLITE NUMBER	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	41 16 54.07S 174 46 57.86E	0.5 1.0	0.2 0.5
54	12	41 16 54.21S 174 46 57.69E	0.6 0.9	0.2 0.3
63	9	41 16 54.12S 174 46 57.76E	0.6 0.9	0.2 0.3
64	7	41 16 54.23S 174 46 57.93E	0.5 0.9	0.2 0.3
65	10	41 16 54.11S 174 46 57.85E	0.6 0.9	0.2 0.3

TABLE 10A-1  
R/V KANA KEOKI 1972 POSITIONAL DATA, CALLAO, PERU  
MOORED TO BERTH 9-D (ON THE 'FISHING PIER')

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
15	1752	63	7	N-E	12 3 17.645	77 9 1.62W	6	0	0	-2.0	2.7
15	2114	42	60	N-W	12 3 22.545	77 9 57.04W	2	23	20	0.2	-0.5
15	2144	64	72	N-E	12 3 21.305	77 9 2.02W	2	31	1	1.7	3.0
* 15	2334	64	7	N-W	12 3 12.665	77 9 2.40W	2	1	0	-7.0	3.4
* 16	44	64	7	N-E	12 3 26.685	77 8 55.14W	6	0	0	7.0	-3.8
* 16	56	65	41	S-E	12 3 19.405	77 8 58.44W	2	20	6	0.2	-0.5
* 16	225	64	84	N-W	12 3 20.465	77 8 40.62W	2	31	20	0.8	-1.3
* 16	344	63	64	S-E	12 3 19.405	77 8 58.12W	2	23	20	-1.0	-0.4
* 16	416	64	7	N-W	12 3 19.085	77 8 56.24W	2	30	0	0.4	7.5
* 16	534	63	5	S-E	12 3 17.125	77 8 56.32W	3	32	0	-2.0	0.4
* 16	550	62	67	S-E	12 3 17.425	77 8 56.06W	2	26	17	-1.0	-0.1
* 16	592	64	56	S-E	12 3 17.425	77 8 56.06W	2	26	17	-1.0	-0.1
* 16	1711	64	13	N-E	12 3 18.425	77 8 56.30W	4	20	0	-1.0	0.7
* 16	1116	64	23	N-E	12 3 19.425	77 8 56.38W	2	20	11	-0.7	1.4
* 16	1222	65	23	N-E	12 3 20.485	77 8 56.70W	7	25	11	-1.0	0.7
* 16	1514	63	10	S-W	12 3 14.605	77 9 56.70W	2	14	3	-1.0	1.0
* 16	1558	64	10	S-W	12 3 14.605	77 9 56.70W	2	14	3	-1.0	1.0
* 17	1612	63	59	N-W	12 3 20.765	77 8 55.32W	2	22	1	1.1	-3.6
* 17	2014	64	8	N-E	12 3 6.495	77 8 31.00W	4	9	4	-12.1	4.1
* 17	2104	42	62	N-W	12 3 21.305	77 8 56.22W	2	34	17	1.7	-2.7
* 17	2154	64	69	N-W	12 3 21.005	77 8 53.70W	2	34	1	1.4	-3.3
* 18	48	64	6	N-E	12 3 16.205	77 8 56.40W	4	12	5	-3.4	0.4
* 18	102	65	64	S-E	12 3 19.245	77 8 56.22W	2	21	15	-1.4	0.3
* 18	232	64	64	N-W	12 3 21.305	77 8 56.10W	2	33	16	1.7	-2.0
* 18	252	65	9	S-E	12 3 13.375	77 8 56.44W	3	9	4	13.6	-2.0
* 18	356	63	66	S-E	12 3 19.305	77 9 11.22W	11	0	0	-1.3	12.1
* 18	446	63	7	S-E	12 3 12.245	77 9 6.12W	5	0	0	-7.4	7.2
* 18	446	62	64	S-E	12 3 15.945	77 9 30.72W	16	0	0	-3.7	31.8
* 18	536	64	73	S-E	12 3 18.495	77 9 34.42W	3	33	0	-1.1	4.5
* 18	1036	42	7	S-E	12 3 20.165	77 9 38.44W	6	0	0	12.5	-0.5
* 18	1128	64	7	S-E	12 3 34.555	77 9 44.60W	2	20	0	14.9	-4.4
* 18	1228	65	34	N-E	12 3 20.645	77 9 46.00W	2	33	16	1.0	1.0
* 18	1530	63	50	N-E	12 3 21.425	77 9 57.00W	2	24	16	1.8	-1.0
* 18	1711	63	15	N-E	12 3 19.555	77 9 54.00W	2	24	11	-1.7	0.7
* 18	2012	42	42	N-E	12 3 20.485	77 9 49.70W	2	31	9	1.3	0.7
* 18	2106	64	13	N-E	12 3 21.005	77 9 50.70W	2	28	7	1.4	1.2
* 18	2200	42	17	N-E	12 3 33.245	77 9 32.00W	2	21	5	13.6	33.1
* 18	2256	64	17	N-E	12 3 19.495	77 9 56.40W	2	13	2	0.2	0.4
19	14	66	21	S-E	12 3 20.225	77 8 50.34W	2	25	11	0.5	0.4
19	143	64	43	S-E	12 3 19.495	77 8 54.80W	2	33	15	0.1	1.5
19	200	65	22	S-W	12 3 12.195	77 9 41.00W	2	20	11	-0.2	-0.1
19	306	63	34	S-E	12 3 14.305	77 8 54.60W	2	30	10	-5.3	-4.0
19	328	64	16	N-W	12 3 20.445	77 8 58.90W	2	22	10	1.3	0.0
19	454	63	21	S-E	12 3 17.705	77 9 56.60W	2	26	12	-1.0	1.6

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10A-1  
R/V KANA KEOKI 1972 POSITIONAL DATA, CALLAO, PERU  
MOORED TO BERTH 9-D (ON THE 'FISHING PIER')

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
19	752	42	26	S-E	12 3 16.205	77 8 50.34W	2	30	14	-0.4	-0.0
19	856	64	31	S-E	12 3 18.005	77 8 57.60W	2	32	15	-1.7	-0.0
19	918	42	26	S-W	12 3 17.945	77 8 55.42W	2	29	14	-1.7	0.1
* 19	1016	44	26	S-W	12 3 17.445	77 8 59.04W	2	30	14	-1.7	0.1
* 19	1142	65	12	N-E	12 3 18.605	77 8 54.00W	3	20	5	-1.0	1.5
* 19	1322	64	37	S-E	12 3 13.525	77 8 46.00W	2	20	5	-0.3	-3.2
* 19	1439	63	14	N-E	12 3 18.245	77 8 46.00W	2	20	3	-1.4	-1.1
* 19	1509	54	26	S-E	12 3 13.565	77 8 46.00W	2	20	2	-3.1	-1.4
* 19	1529	63	44	N-E	12 3 12.095	77 8 57.60W	2	20	10	1.0	-1.4
* 19	1622	64	12	N-E	12 3 16.065	77 8 57.20W	2	13	4	-4.0	2.2
* 19	1702	42	12	N-E	12 3 18.705	77 8 57.70W	4	14	3	-1.3	1.9
* 19	2022	64	15	N-E	12 3 21.005	77 8 57.70W	4	14	3	-0.3	-2.6
* 19	2104	42	16	S-W	12 3 21.605	77 8 56.40W	2	34	15	2.0	-1.7
* 19	2204	64	47	N-E	12 3 21.605	77 8 57.24W	2	22	2	2.0	-1.7
* 20	60	64	14	N-E	12 3 16.225	77 8 54.00W	2	20	9	0.3	0.0
* 20	223	63	11	S-E	12 3 24.425	77 8 52.28W	3	15	7	0.8	0.3
* 20	404	63	48	S-E	12 3 22.145	77 8 56.28W	2	32	16	2.8	0.6
* 20	702	42	67	S-E	12 3 19.795	77 8 56.56W	3	35	17	-0.3	0.6
* 20	804	64	10	S-E	12 3 10.395	77 8 57.44W	4	13	1	13.4	2.6
* 20	946	64	64	S-E	12 3 10.025	77 8 53.98W	3	29	0	-0.6	-5.1
* 20	1032	42	7	S-E	12 3 28.425	77 9 1.62W	15	36	18	-1.3	2.7
* 20	1238	65	51	N-E	12 3 20.425	77 9 1.62W	2	34	3	1.2	0.3
* 20	1416	64	52	N-E	12 3 15.995	77 9 3.84W	2	21	13	-3.1	4.3
* 20	1532	63	66	N-S	12 3 21.305	77 9 3.84W	2	24	0	1.7	4.0
* 20	2009	42	42	N-E	12 3 20.465	77 9 3.84W	2	19	5	0.4	0.0
* 20	2114	64	53	N-E	12 3 21.465	77 9 3.00W	2	31	6	0.8	4.0
* 20	2156	42	16	N-W	12 3 21.605	77 9 0.24W	2	10	5	2.0	1.1
* 20	2304	64	10	N-W	12 3 19.265	77 9 0.24W	6	12	0	-0.4	1.0
21	24	66	33	S-E	12 3 10.145	77 8 56.80W	2	29	13	-0.5	0.4
21	144	64	58	N-E	12 3 21.655	77 9 3.00W	2	34	15	-0.2	4.6
21	212	75	18	S-E	12 3 12.225	77 9 52.00W	2	23	11	-0.4	0.1
21	216	63	45	S-E	12 3 18.225	77 9 52.00W	2	32	16	-0.0	-0.7
* 21	2162	63	14	S-E	12 3 18.005	77 9 56.61W	2	22	10	-0.7	-0.4
21	750	42	31	S-E	12 3 18.005	77 9 56.61W	2	20	3	-1.5	0.2
21	634	42	28	S-E	12 3 13.125	77 9 56.04W	2	24	11	-1.1	0.1
21	1044	64	14	S-E	12 3 14.125	77 9 56.04W	2	28	13	-0.3	1.1
21	1152	65	10	S-E	12 3 20.405	77 9 56.12W	2	31	16	-0.3	-0.6
21	1326	64	40	S-E	12 3 10.205	77 9 58.12W	2	20	6	0.0	1.3
21	1444	63	26	S-E	12 3 19.805	77 9 58.12W	2	20	6	0.0	1.3
21	1412	64	17	S-E	12 3 18.785	77 9 58.40W	2	26	17	-0.8	0.4
21	1530	63	30	N-W	12 3 19.425	77 9 58.78W	2	20	4	0.2	-0.8
* 21	1916	42	14	N-E	12 3 19.505	77 9 58.78W	2	15	6	-0.1	0.6
21	2030	64	21	N-E	12 3 19.445	77 9 58.78W	2	20	5	-0.2	1.8
21	2100	42	51	N-E	12 3 20.765	77 9 58.78W	2	32	11	1.1	-2.2
21	2214	64	32	N-E	12 3 20.645	77 9 58.78W	2	30	7	1.0	-1.2

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10A-1 (CONT.)  
R/V KANA KEOKI 1972 POSITIONAL DATA, CALLAO, PERU  
MOORED TO BERTH 9-D (ON THE "FISHING PIER")

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
• 21 2338	65	10	S-E	12 3 19.245	77 8 56.16W	2 13 6	-4.4	-2.8			
22 52	54	15	N-E	12 3 20.285	77 8 56.70W	2 25 12	0.7	0.7			
22 122	63	55	S-E	12 3 19.605	77 8 56.72W	2 30 15	-1.2	-0.4			
22 226	43	17	S-E	12 3 19.205	77 8 56.72W	2 25 11	-0.4	-1.4			
22 244	54	34	N-W	12 3 21.265	77 8 57.04W	2 22 14	1.6	-1.6			
22 412	43	42	S-E	12 3 19.505	77 8 56.48W	2 22 11	-0.1	0.4			
22 512	64	14	S-E	12 3 19.045	77 8 57.45W	2 22 10	-0.4	-1.3			
22 540	42	76	S-E	12 3 19.145	77 8 58.00W	2 21 0	0.6	-0.2			
22 556	64	46	S-E	12 3 19.145	77 8 58.20W	2 34 16	-0.5	-0.8			
• 22 1236	54	13	S-E	12 3 20.105	77 8 57.72W	3 20 9	0.5	-1.2			
• 22 1254	45	75	N-E	12 3 21.065	77 9 1.62W	3 23 1	1.4	2.7			
• 22 1356	63	7	N-E	12 2 25.265	77 9 6.84W	10 4 2	-23.8	7.9			
22 1420	54	56	S-W	12 3 19.145	77 8 59.64W	2 30 10	-0.5	0.7			

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10B-1  
ARITHMETIC MEAN SOLUTION AT CALLAO BERTH 9-C

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
104	24	70	12 3 19.625 77 8 58.97W	1.5 2.3	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>5 >10 SECS OF ARC
15	1752	X		X
15	2334	X		
16	44	X		X
16	226		X	
16	415	X		X
16	534	X		
16	1039	X		
16	1116	X		
16	1514		X	
16	1658	X		
17	2014	X		X
18	449	X		
18	222	X		X
18	356		X	
18	546	X		X
18	844		X	
18	936		X	X
18	1035	X		X
18	1129	X		XX
18	2200			X
18	1142	X		
19	1020	X		
20	50	X		
20	222	X		
20	772	X		X
20	804	X		
20	1032	X		X
20	1720	X		
20	2304	X		X
21	502	X		
21	1216	X		
21	2338	X		
22	1235	X		
22	1358	X		X

TABLE 10C-1  
BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT CALLAO BERTH 9-C

SATELLITE	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	14	12 3 16.985 77 8 57.94W	1.6 2.1	0.4 0.6
54	13	12 3 20.045 77 8 57.84W	1.7 2.1	0.5 0.6
53	15	12 3 20.265 77 8 57.82W	1.6 2.0	0.4 0.5
54	16	12 3 20.045 77 8 57.92W	1.5 2.1	0.4 0.5
65	13	12 3 20.045 77 8 57.82W	1.7 2.1	0.5 0.5

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TABLE 10A-2  
P/V KANA KOKI 1972 POSITIONAL DATA. CALLAO, PERU  
HECRED TO EARTH 4-A

DAY	GMT	SAT	ELEV	CECM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)			
								CTS	CTSQ	LATITUDE LONGITUDE	
54	706	64	77	S-E	12 2 49.325	77 8 42.42W	2	30	0	-1.1	-2.5
54	745	42	14	S-W	12 2 49.265	77 8 44.82W	2	23	10	-1.2	-0.1
* 54	656	64	7	S-W	12 3 24.895	77 8 44.20W	3	5	2	12.5	1.2
* 54	1010	65	39	N-E	12 2 41.965	77 8 46.20W	2	36	13	-1.3	1.2
* 54	1150	64	76	S-W	12 2 49.045	77 8 46.80W	2	33	12	-1.1	-2.1
* 54	1240	63	29	N-E	12 2 50.045	77 8 44.76W	2	26	12	-0.4	-2.2
* 54	1342	64	7	S-W	12 3 17.755	77 8 45.44W	16	0	0	27.3	4.5
* 54	1430	63	24	N-W	12 2 52.335	77 8 46.76W	2	23	10	-2.2	-0.2
* 54	1724	42	21	N-E	12 2 50.345	77 8 46.30W	2	27	13	-0.1	0.7
* 54	1816	64	40	N-E	12 2 51.745	77 8 46.70W	2	31	1	1.1	0.8
* 54	1914	42	34	N-W	12 2 51.795	77 8 44.10W	2	25	10	1.4	-0.0
* 54	2024	64	18	N-W	12 2 51.725	77 8 42.95W	2	20	1	1.3	-2.0
* 54	2154	65	24	S-E	12 2 49.445	77 8 42.25W	2	25	4	-1.0	-1.7
* 54	2219	64	51	N-E	12 2 52.025	77 8 46.20W	2	33	0	1.6	1.2
* 54	2340	65	26	S-W	12 2 47.855	77 8 46.85W	2	29	14	-2.4	1.0
55	26	63	22	S-E	12 2 49.145	77 8 43.10W	2	26	12	-1.2	-1.8
* 55	1028	64	17	S-E	12 2 50.945	77 8 46.70W	2	24	1	2.4	-0.3
* 55	1204	65	37	S-E	12 3 29.445	77 8 44.90W	2	21	10	-2.6	0.2
* 55	1254	42	14	S-E	12 2 49.445	77 8 41.94W	2	32	14	-0.2	-1.1
* 55	1320	64	20	S-E	12 2 50.205	77 8 45.00W	2	32	10	-1.2	-2.2
* 55	1400	42	52	S-E	12 2 48.205	77 8 44.40W	2	30	14	-2.9	-2.4
* 55	1804	64	26	S-E	12 2 47.765	77 8 44.40W	2	30	14	-0.2	-0.2
* 55	1924	65	13	S-E	12 2 46.365	77 8 44.12W	4	22	10	-1.6	-1.2
* 55	2100	64	77	S-E	12 2 49.045	77 8 40.04W	2	21	15	-1.6	-1.2
* 55	2154	63	78	S-E	12 2 51.645	77 8 41.54W	4	21	3	-1.4	-1.2
* 55	1246	64	16	N-E	12 2 49.595	77 8 46.30W	2	25	11	-0.2	0.3
* 55	1340	63	65	N-E	12 2 51.695	77 8 46.92W	2	21	0	3.2	-1.0
* 55	1748	64	14	N-E	12 2 51.665	77 8 45.54W	2	21	0	1.5	0.3
* 55	1814	42	74	N-E	12 2 51.105	77 8 45.37W	2	33	1	2.7	3.4
* 55	1934	63	51	N-W	12 2 53.285	77 8 42.80W	2	22	2	2.2	-2.4
* 55	2024	42	7	N-W	12 2 49.025	77 8 42.42W	6	22	1	-1.4	-2.5
* 55	2226	64	19	N-E	12 2 50.045	77 8 45.90W	2	23	5	-2.4	0.2
* 55	2252	65	56	S-W	12 2 46.565	77 8 43.70W	2	20	1	-3.0	0.7
56	12	64	36	N-W	12 2 51.785	77 8 42.00W	2	33	15	1.4	-2.1
* 56	42	65	7	S-W	12 2 51.885	77 8 45.76W	7	0	0	0.5	14.4
* 56	120	63	53	S-E	12 2 49.205	77 8 22.16W	5	23	0	-1.2	-12.3
* 56	310	63	7	S-E	12 2 44.765	77 8 47.10W	2	31	0	-5.7	2.1
* 56	556	42	51	S-E	12 2 47.425	77 8 44.04W	2	33	10	-2.2	-0.2
* 56	718	64	73	S-E	12 2 47.165	77 8 43.34W	2	28	0	-3.7	-1.5
* 56	742	42	14	S-E	12 2 49.925	77 8 43.36W	2	21	10	-0.5	-1.1
* 56	528	64	7	S-E	12 3 12.245	77 8 43.16W	4	0	0	21.0	8.2
* 56	1012	64	11	S-E	12 2 49.565	77 8 43.32W	4	15	7	-0.2	-1.6
* 56	1028	65	55	N-E	12 2 53.885	77 8 46.44W	2	20	1	3.5	1.2
* 56	1154	64	58	N-E	12 2 49.445	77 8 46.94W	2	34	15	-1.0	-0.9
* 56	1250	63	42	N-E	12 2 52.385	77 8 45.66W	2	28	0	2.0	0.7
* 56	1436	63	16	N-E	12 2 52.505	77 8 43.20W	2	20	7	2.1	-1.9

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10A-2  
P/V KANA KOKI 1972 POSITIONAL DATA. CALLAO, PERU  
HECRED TO EARTH 4-A

DAY	GMT	SAT	ELEV	CECM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)			
								CTS	CTSQ	LATITUDE LONGITUDE	
56	1726	42	23	N-E	12 2 51.645	77 8 46.10W	2	28	12	1.5	0.2
56	1846	64	56	N-E	12 2 51.605	77 8 45.60W	2	27	0	1.2	0.5
* 56	1529	42	31	N-W	12 2 51.685	77 15 22.17W	3	27	0	21.5	30.7
* 56	2034	64	21	N-W	12 2 51.725	77 8 46.60W	3	13	4	1.3	0.5
* 56	2224	65	36	S-E	12 2 46.205	77 8 41.77W	2	30	1	-1.2	-3.2
* 56	2320	54	74	N-E	12 2 51.485	77 8 45.14W	4	32	0	1.1	5.4
* 56	2350	65	10	S-E	12 2 48.365	77 8 44.34W	2	24	6	-1.5	0.4
57	32	63	32	S-E	12 2 43.045	77 8 42.00W	2	21	8	-2.4	-2.1
* 57	110	64	8	S-E	12 2 40.345	77 8 43.32W	3	10	4	-1.0	-1.0
* 57	204	42	15	S-E	12 2 40.705	77 8 42.00W	2	22	10	0.7	-2.6
* 57	228	64	42	S-E	12 2 40.395	77 8 43.34W	2	31	13	-1.1	-1.5
* 57	240	42	47	S-E	12 2 40.225	77 8 45.12W	2	29	10	-1.5	2.2
* 57	617	64	17	S-E	12 2 40.415	77 8 44.52W	2	24	11	-1.5	-0.4
* 57	932	64	55	S-E	12 2 40.105	77 8 44.80W	2	26	14	2.7	-0.1
* 57	1164	64	40	S-E	12 2 40.445	77 8 43.10W	2	32	15	-1.8	-1.6
* 57	1124	65	40	N-W	12 2 52.715	77 8 42.14W	2	24	9	2.3	-1.6
* 57	1202	63	14	S-E	12 2 42.695	77 8 43.14W	3	21	9	2.3	-1.1
* 57	1250	54	14	S-E	12 2 46.425	77 8 44.02W	2	21	10	-0.2	-0.7
* 57	1246	63	47	N-E	12 2 47.285	77 8 42.14W	2	26	0	2.6	-2.6
* 57	1758	64	22	N-E	12 2 51.045	77 8 44.74W	2	27	10	2.4	5.2
* 57	1816	42	52	N-E	12 2 53.345	77 8 46.16W	3	22	10	2.4	2.4
* 57	1944	64	52	N-W	12 2 49.025	77 8 44.15W	2	20	10	2.4	-31.7
* 57	2104	42	7	S-E	12 2 40.905	77 8 45.72W	1	19	0	-0.6	-7.0
* 57	2119	65	12	S-E	12 2 47.525	77 8 41.74W	2	30	14	-1.2	0.8
* 57	2130	64	24	S-E	12 2 46.525	77 8 45.72W	2	30	17	-1.6	2.2
* 57	2232	65	55	S-E	12 2 42.505	77 8 47.16W	2	34	17	-1.6	2.2
* 57	2340	64	10	S-E	12 2 35.945	77 8 43.04W	3	13	1	-10.7	1.4
58	16	64	30	N-W	12 2 50.345	77 8 43.10W	2	20	14	-0.1	-1.9
* 58	12H	63	61	S-E	12 3 21.725	77 8 42.04W	2	22	0	21.3	-32.7
* 58	542	64	14	S-E	12 2 49.125	77 8 42.36W	2	21	9	-0.3	-2.3
* 58	600	42	53	S-E	12 2 48.125	77 8 43.36W	2	11	1	-2.3	3.4
* 58	728	64	45	S-E	12 2 48.145	77 8 43.55W	2	24	16	-2.2	-1.1
* 58	649	65	7	N-E	12 2 53.045	77 8 41.40W	11	0	0	2.6	-3.6
* 58	1114	64	16	S-E	12 2 50.645	77 8 42.50W	2	23	11	0.2	-2.1
* 58	1032	65	79	N-E	12 2 53.045	77 8 53.42W	6	21	2	2.6	8.6
* 58	1155	64	43	S-E	12 2 49.285	77 8 43.00W	2	21	14	-1.3	-1.0
* 58	1219	65	8	N-W	12 2 48.605	77 8 45.18W	2	21	4	-1.6	0.2
* 58	1252	63	62	N-E	12 2 52.385	77 8 46.32W	2	20	1	2.0	1.4

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 10B-2

NP	N	ASC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)	
					1.9	0.3
84	30	54	77 8 44.97W	2.5		

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS >5	DEVIATION	
				>5	>10 SEC'S OF ARC
54	704		X		
54	856	X			X
54	1150		X		
54	1342	X		X	X
55	144		X		
55	524	X			X
55	924	X			
55	1154	X			
55	1748	X			
55	1816		X		
55	2004	X		X	X
55	42	X		X	X
55	120		X		
56	310	X			
56	742	X			
56	928	X			X
56	1012	X			
56	1908				X
56	2034	X			
57	116	X			
57	1202	X			
57	1250	X			
57	2004	X		X	X
57	2118	X			
57	2344	X			X
58	128				X
58	542	X			
58	848	X		X	
58	1032		X		
58	1218	X			

TABLE 10C-2  
BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT CALLAO BERTH 4-A

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	10	12 2 50.14S	1.9	0.5
		77 8 46.01W	3.6	1.1
54	12	12 2 53.14S	1.8	0.5
		77 8 45.79W	3.3	1.0
63	10	12 2 50.14S	1.9	0.5
		77 8 46.01W	3.6	1.1
64	12	12 2 50.14S	1.9	0.5
		77 8 45.79W	3.3	1.0
65	10	12 2 50.14S	1.9	0.5
		77 8 46.01W	3.6	1.1

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TABLE III-A-1  
F/V KANA KOKI 1972 POSITIONAL DATA, ANCON, PERU  
SWINGING AT ANCHOR, BUT NOT DRAGGING

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
69	2354	53	16		11 44 26.76S	77 10 28.56W	2	0	0	-4.8	3.4
69	20	54	23		11 44 22.88S	77 10 22.85W	2	0	0	1.4	-1.0
69	1328	63	48		11 44 33.72S	77 10 24.20W	2	0	0	2.2	3.5
69	620	42	51		11 44 26.52S	77 10 17.40W	2	0	0	-2.0	-7.3
69	7124	54	33		11 44 30.78S	77 10 25.56W	2	0	0	-0.7	0.4
*	69	656	44		11 44 34.44S	77 10 24.70W	2	0	0	2.0	2.0
*	69	10118	54	10	11 44 30.76S	77 10 24.66W	2	0	0	-0.7	-0.1
69	1040	65	70		11 44 36.00S	77 10 24.48W	2	0	0	4.5	-0.3
69	1202	54	32		11 44 31.68S	77 10 26.16W	2	0	0	0.2	1.4
*	69	1230	65	7	11 44 25.62S	77 10 36.72W	7	0	0	-6.3	12.0
*	69	1306	63	77	11 45 14.76S	77 10 35.46W	8	0	0	43.2	550.7

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE III-E-1  
ARITHMETIC MEAN SOLUTION AT ANCON - ANCHORED

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
11	3	6	11 44 31.51S 77 10 24.73W	2.8 3.5	1.0 1.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION >10 SEC OF ARC
			<15	>75	
60	856	X			
60	1230	X			X
60	1306		X	X	X

TABLE III-C-1  
BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT ANCON - ANCHORED

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	11 44 29.52S 77 10 17.40W		
54	3	11 44 31.06S 77 10 21.44W	1.7 3.8	1.0 2.2
63	2	11 44 31.20S 77 10 20.13W	2.4 3.9	1.7 2.7
64	1	11 44 29.52S 77 10 17.40W		

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TABLE 12A-1  
P/V KANA KEKII 1972 POSITIONAL DATA, TALARA, PERU  
SWINGING AT ANCHOR, BUT NOT DRAVING

DAY	GMT	SAT	ELFV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
74	50E	64	21	S-E	4 33 41.565	81 17 16.82W	2	23	7	-2.6	-0.4
* 74	52E	42	79	S-E	4 33 49.625	81 17 15.12W	5	26	10	-4.0	-4.7
74	52E	64	34	S-E	4 33 49.625	81 17 15.12W	5	26	14	-3.2	-1.4
* 74	52E	65	9	N-E	4 33 47.705	81 17 20.81W	4	32	5	-2.2	0.4
* 74	55E	64	7	S-E	4 33 42.095	81 17 17.64W	0	0	3	4.5	-2.5
74	102E	75	62	N-W	4 33 47.825	81 17 14.76W	2	33	2	3.5	-2.4
74	104E	64	76	S-W	4 33 43.585	81 17 14.76W	2	34	16	-0.5	-5.7
74	122E	63	47	N-E	4 33 46.205	81 17 14.25W	2	27	0	4.7	13.0
74	141E	63	7	N-E	4 33 30.565	81 17 18.24W	2	0	0	-13.4	-2.2
* 74	164E	64	11	N-E	4 33 45.595	81 17 21.84W	2	13	3	1.3	1.4
74	165E	42	41	N-E	4 33 47.345	81 17 23.04W	2	18	5	2.0	2.6
74	182E	64	60	N-W	4 33 48.405	81 17 19.20W	2	21	14	4.1	-1.2
* 74	214E	65	76	S-E	4 33 45.725	81 17 30.11W	4	23	0	1.2	0.7
74	221E	54	60	N-E	4 33 48.205	81 17 25.14W	2	35	16	1.7	4.7

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 12B-1  
ARITHMETIC MEAN SOLUTION AT TALARA - ANCHORED, SWINGING

RF	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
25	14	11	4 33 44.515 81 17 20.44W	2.7 2.3	0.4 0.7

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION >10 SECS OF ARC
			<15	>75	
74	52E		X	X	
74	52E		X	X	
74	55E		X	X	
74	104E				
74	102E				
74	122E				X
74	141E		X		X
74	164E		X		
74	214E		X		
75	0			X	
75	148		X		
75	60E			X	X
75	75E		X	X	X
75	110E		X		
75	132E		N-W		
75	160E		X		X

TABLE 12C-1  
P/V SATELLITE ---- ARITHMETIC MEAN SOLUTION AT TALARA - ANCHORED, SWINGING

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	4 33 44.555 81 17 20.28W	3.0 3.9	2.8 2.4
54	3	4 33 45.105 81 17 21.90W	2.9 3.0	1.7 2.3
63	1	4 33 47.345 81 17 23.04W		
64	3	4 33 45.105 81 17 21.90W	2.9 2.9	1.7 2.1
65	2	4 33 44.555 81 17 20.28W	3.0 3.9	2.8 2.4

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TABLE 13A-1  
F/V KANA KEKII 1972 POSITIONAL DATA, GUAYAQUIL, ECUADOR  
MOORED AT BERTH NUMBER 2, PUERTO MARITIMO

DAY	GMT	SAT	ELEV	CECM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
104	1656	65	31	S-E	2 16 58.265	79 54 20.44W	3	34	16	-1.6	0.5
104	1936	64	36	N-E	2 16 51.145	79 54 21.14W	2	30	15	-1.3	0.8
104	2042	64	27	S-W	2 16 57.725	79 54 15.04W	2	25	11	-2.1	-1.3
104	2124	64	10	N-W	2 16 50.905	79 54 21.42W	2	23	11	-1.1	1.1
104	2236	63	64	S-W	2 16 54.685	79 54 17.23W	2	24	0	-1.2	-3.1
105	152	42	7	S-E	2 17 1.025	79 54 18.40W	3	6	1	1.2	-2.3
105	306	64	27	S-E	2 16 57.485	79 54 19.94W	2	30	14	-2.6	-0.4
105	234	62	65	S-E	2 17 0.365	79 54 17.24W	2	23	1	0.5	-3.1
105	452	64	27	S-E	2 16 59.105	79 54 18.72W	2	25	9	-0.7	-1.6
*105	632	65	13	N-E	2 17 0.445	79 54 20.42W	2	19	8	1.0	0.6
105	714	64	21	S-E	2 16 57.125	79 54 20.46W	2	24	14	-2.7	-0.1
105	819	65	40	N-W	2 17 1.865	79 54 15.34W	2	30	15	2.0	-2.2
105	900	64	33	S-W	2 16 57.185	79 54 20.84W	2	31	15	-2.7	0.6
*105	1010	63	56	N-E	2 17 1.345	79 54 27.34W	2	21	1	1.5	7.0
105	1220	63	6	N-W	2 16 56.865	79 54 20.76W	2	17	3	-4.0	0.4
105	1442	64	15	N-E	2 17 1.905	79 54 21.12W	2	19	2	2.0	0.9
105	1505	64	42	S-E	2 17 1.265	79 54 23.29W	2	26	0	1.4	2.0
105	1626	64	46	N-W	2 17 1.925	79 54 16.30W	2	32	2	2.1	-2.0
*105	1656	62	0	N-W	2 16 45.365	79 54 16.20W	2	12	0	-14.5	-1.1
*105	1810	65	10	S-E	2 17 2.705	79 54 20.53W	4	16	7	2.3	0.2
*105	1850	64	10	N-E	2 17 3.125	79 54 21.06W	3	16	7	0.7	2.7
105	2054	65	70	S-W	2 16 58.745	79 54 15.94W	2	35	1	-1.1	-4.5
105	2052	64	59	N-W	2 17 1.925	79 54 17.52W	2	16	17	1.1	-2.8
105	2148	63	45	S-E	2 16 58.385	79 54 20.48W	2	13	16	-1.6	0.5
*105	2336	63	14	S-W	2 16 58.685	79 54 20.44W	2	17	3	-1.2	0.3
*106	220	64	7	S-E	2 17 2.765	79 54 17.04W	5	3	0	2.0	-3.7
106	240	62	36	S-E	2 16 57.945	79 54 21.80W	2	24	10	-1.0	1.5
106	402	64	71	S-W	2 16 55.985	79 54 13.50W	2	34	1	0.0	-2.0
106	426	62	19	S-W	2 17 2.105	79 54 20.81W	2	21	1	2.3	0.5
106	729	65	44	N-E	2 17 1.925	79 54 26.64W	2	22	3	2.1	6.6
*106	FCP	64	77	S-E	2 16 59.505	79 54 25.04W	2	20	15	-1.1	4.7
*106	915	65	7	N-W	2 16 54.225	79 54 24.42W	2	20	0	1.2	1.1
106	959	64	7	S-W	2 17 1.705	79 54 24.62W	2	12	0	4.0	2.2
106	1210	63	29	N-E	2 17 1.735	79 54 24.20W	12	0	0	1.9	-1.1
106	1337	64	64	S-E	2 17 1.325	79 54 26.25W	2	35	17	-1.5	4.0
106	1456	62	37	N-E	2 16 54.665	79 54 19.67W	2	31	15	-1.3	-1.4
*106	1726	64	9	S-W	2 17 0.605	79 54 21.00W	3	12	5	0.8	3.7
106	1904	63	46	S-E	2 16 59.105	79 54 20.84W	2	34	16	-0.7	0.5
106	1942	64	45	N-E	2 17 0.845	79 54 23.76W	2	29	15	1.0	3.4
106	2054	65	18	S-W	2 15 59.285	79 54 19.94W	2	27	13	-0.6	-2.4
106	2130	64	14	N-W	2 16 54.245	79 54 22.92W	4	17	1	-5.5	2.5
106	2246	63	43	S-W	2 16 57.785	79 54 19.20W	2	30	1	-2.1	-1.1
*107	149	42	5	S-E	2 17 2.285	79 54 16.34W	3	12	5	2.4	-4.0
107	314	64	40	S-E	2 16 53.565	79 54 19.94W	2	21	15	-1.3	0.6
107	234	62	64	S-W	2 16 58.265	79 54 19.50W	2	29	0	-1.6	0.8

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13A-1  
F/V KANA KEKII 1972 POSITIONAL DATA, GUAYAQUIL, ECUADOR  
MOORED AT BERTH NUMBER 2, PUERTO MARITIMO

DAY	GMT	SAT	ELEV	CECM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
107	502	64	17	S-E	2 16 52.105	79 54 19.50W	2	19	6	-0.7	-0.4
107	442	65	22	N-E	2 17 1.205	79 54 21.62W	2	25	12	1.4	1.1
107	719	64	28	S-E	2 16 58.085	79 54 20.15W	2	31	15	-1.8	-0.2
107	828	65	26	N-W	2 17 1.565	79 54 19.50W	2	37	12	1.7	-0.8
107	906	64	24	S-W	2 16 57.505	79 54 20.44W	2	26	12	-2.2	2.1
*107	1020	63	77	N-E	2 17 0.305	79 54 14.04W	2	36	17	1.1	-6.1
107	1450	64	23	S-E	2 17 1.145	79 54 21.66W	2	28	1	1.8	-1.3
107	1736	64	32	N-E	2 17 0.745	79 54 18.78W	2	24	7	0.5	-1.8
107	1919	65	17	S-E	2 16 58.025	79 54 22.10W	2	24	0	-1.8	-0.5
107	1952	64	15	N-E	2 17 1.085	79 54 21.84W	2	23	11	1.9	-1.5
107	2004	65	48	S-W	2 16 57.745	79 54 18.36W	2	36	17	-2.1	-0.0
107	2036	64	44	N-E	2 17 0.445	79 54 18.00W	2	29	12	0.6	-2.4
107	2156	63	46	S-E	2 16 58.325	79 54 21.72W	2	32	1	-1.5	1.4
*107	2246	63	8	S-W	2 17 1.745	79 54 19.67W	2	7	1	0.1	-0.7
*108	228	64	13	S-E	2 16 53.745	79 54 19.20W	2	21	10	-0.1	-1.1
108	412	64	48	S-E	2 16 58.325	79 54 19.00W	2	10	5	1.3	-1.2
*108	630	64	7	S-E	2 17 1.145	79 54 17.34W	2	29	0	1.5	-1.2
108	732	65	73	N-W	2 17 1.385	79 54 14.50W	2	31	1	-0.5	-1.3
108	812	64	73	S-W	2 16 54.345	79 54 14.44W	2	29	1	2.9	-1.7
108	930	63	32	N-E	2 17 2.045	79 54 20.00W	2	22	28	1.4	-0.5
108	1119	63	19	N-W	2 17 1.325	79 54 14.04W	2	24	1	1.6	-6.3
*108	1466	64	7	N-E	2 16 47.465	79 54 20.00W	2	20	0	0.0	2.0
108	1466	64	66	S-E	2 17 1.345	79 54 22.67W	2	23	0	0.7	2.0
108	1714	65	45	S-E	2 16 59.125	79 54 22.67W	2	24	0	0.7	2.0
108	1846	64	64	N-E	2 17 0.605	79 54 22.67W	2	23	16	0.6	4.0
*108	2104	65	11	S-W	2 17 1.705	79 54 22.42W	2	13	12	1.1	2.0
*108	2136	64	9	N-W	2 16 52.465	79 54 21.14W	2	11	0	-7.0	0.8
108	2256	63	24	S-E	2 16 54.265	79 54 16.44W	2	27	2	-1.6	-2.6
*109	144	62	10	S-E	2 16 55.205	79 54 18.44W	2	15	7	-4.6	-1.8
109	224	64	60	S-E	2 16 57.725	79 54 21.12W	2	34	9	2.6	-0.8
*109	612	64	10	S-W	2 17 3.365	79 54 21.66W	2	10	0	1.6	-0.6
109	652	65	36	N-E	2 17 1.625	79 54 21.66W	2	20	13	1.8	1.6
109	720	64	48	S-E	2 16 59.295	79 54 20.52W	2	22	14	-0.6	0.2
109	839	65	15	N-W	2 17 1.245	79 54 21.74W	2	17	7	3.4	1.4
109	939	64	19	S-E	2 16 59.445	79 54 16.74W	2	25	7	-0.4	-0.6
109	1029	63	53	N-W	2 17 0.645	79 54 17.14W	2	35	18	1.0	1.5
*109	1456	64	35	N-E	2 17 7.345	79 54 32.82W	2	14	7	7.5	12.5
109	1446	64	20	S-E	2 17 0.745	79 54 20.04W	2	18	1	0.9	-0.3
109	1426	65	24	S-E	2 16 59.045	79 54 19.32W	2	21	4	-1.9	-0.3
109	1556	64	21	N-E	2 17 0.065	79 54 22.02W	2	25	3	0.2	1.4
109	2014	65	33	S-W	2 16 58.295	79 54 19.02W	2	23	15	-1.6	-1.3
109	2042	64	33	N-W	2 16 59.705	79 54 18.70W	2	22	11	-0.1	-1.3
*109	2204	63	81	S-E	2 17 1.805	79 54 24.00W	2	31	0	2.0	-1.0
*110	232	64	22	S-E	2 20 12.195	79 54 43.02W	3	22	10	102.3	-157.3
110	420	62	15	S-W	2 15 59.945	79 54 19.32W	3	10	8	0.1	-1.0
*110	606	65									

TABLE 13E-1 (CONT.)  
R/V KANA KEOKI 1972 POSITIONAL DATA, GUAYAQUIL, ECUADOR  
MOORED AT BERTH NUMBER 2, PUERTO MARITIMO

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)				
							IT	CTS	CTS0	LATITUDE	
*110	622	84	11	S-E	2 17 1.26S	79 54 15.08W	2	18	9	1.4	-1.3
110	748	65	50	N-E	2 17 0.36S	79 54 17.54W	2	31	15	0.5	-2.8
110	616	54	56	S-E	2 16 59.26S	79 54 18.54W	2	35	17	-1.5	-1.5
110	540	63	57	N-E	2 17 1.22S	79 54 23.04W	2	34	2	1.4	3.5
*110	1128	63	12	N-E	2 17 0.30S	79 54 24.76W	2	16	9	2.5	0.4
110	1406	42	24	N-E	2 17 1.02S	79 54 26.04W	2	27	0	1.2	-0.3
110	1550	42	30	N-E	2 17 0.67S	79 54 16.34W	2	31	15	0.8	-2.0
*110	1742	45	7	S-E	2 16 58.14S	79 54 17.82W	7	0	0	-1.7	-2.5
110	1724	65	81	S-E	2 16 59.28S	79 54 11.04W	2	30	0	-0.6	-0.3
*110	1640	54	84	N-E	2 17 2.10S	79 54 38.10W	3	34	14	2.3	17.8
*110	2140	54	7	N-E	2 16 43.58S	79 54 24.42W	6	0	0	-15.9	4.1
110	2304	63	19	S-E	2 16 59.29S	79 54 19.86W	2	25	13	-0.6	-0.6
* = FIX NOT USED FOR COMPUTATION OF THE MEAN											

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13E-1  
ARITHMETIC MEAN SOLUTION AT GUAYAQUIL, BERTH # 2

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
110	37	73	2 16 59.24S 79 54 20.35W	1.5 2.4	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS			DEVIATION <15 >75 >5 >10 SECS OF ARC
			<15	>75	>5	
103	152	X				
105	622	X				
105	1200	X				X
105	1656	X				X
105	1810	X				
105	1950	X				
105	2336	X				
106	220	X				X
106	800	X	X			
106	918	X				
106	958	X	X			
106	1726	X				
106	2130	X				
107	148	X				
107	1020	X				
107	2346	X				
108	228	X				
108	630	X				X
108	718	X				
108	1406	X				X
108	2104	X				
108	2116	X				
109	146	X				
109	512	X				
109	1458	X				
109	2234	X				
110	232	X				X
110	608	X				
110	632	X				
110	1128	X				
110	1742	X				X
110	1926	X				
110	1950	X				X
110	2140	X				
111	140	X				
111	850	X				
111	914	X				

TABLE 13C-1  
BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT GUAYAQUIL, BERTH # 2

SATELLITE NUMBER	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	10	2 16 59.97S 79 54 19.90W	1.6	0.4
64	18	2 16 59.57S 79 54 20.27W	1.7	0.4
62	13	2 16 59.88S 79 54 20.15W	1.5	0.4
64	14	2 16 59.62S 79 54 20.21W	1.6	0.4
66	19	2 16 59.75S 79 54 20.35W	1.7	0.4

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TABLE 13A-2  
F/V KANA KEOKI 1973 POSITIONAL DATA, GUAYAQUIL, ECUADOR,  
PORT SIDE TO BERTH NO. 2, PUERTO MARITIMO, STERN 13 METERS BEYOND END.

DAY	GMT	SAT	ELEV	GFCM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
46	1814	64	30	N-E	2 17 17.745	79 54 20.46W	2	24	4	2.0	-0.0
46	1924	42	71	N-E	2 17 14.325	79 54 20.46W	3	34	17	1.6	-0.2
46	2000	64	23	N-W	2 17 31.785	79 54 17.54W	2	25	6	4.6	-2.5
46	2224	42	7	N-W	2 17 24.525	79 54 24.14W	4	5	2	2.6	3.7
46	2224	42	PC	N-E	2 17 14.445	79 54 23.44W	2	30	1	1.7	3.0
46	2320	65	54	S-E	2 16 57.905	79 54 22.40W	2	31	15	-1.9	2.3
47	14	64	7	N-W	2 16 56.705	79 54 26.74W	5	0	0	-1.1	6.1
47	110	65	6	S-E	2 17 22.625	79 54 16.80W	2	11	4	2.8	-0.7
47	202	63	24	S-W	2 16 59.205	79 54 17.82W	2	30	14	-1.6	-2.6
47	652	64	19	S-E	2 16 58.165	79 54 21.62W	2	26	12	-1.0	1.0
47	658	42	41	S-E	2 16 59.165	79 54 21.64W	2	34	17	-0.6	1.1
47	734	64	38	S-W	2 16 59.445	79 54 17.58W	2	31	11	-1.3	-2.0
47	846	42	17	S-W	2 16 59.765	79 54 18.48W	2	22	15	0.7	-2.0
47	1000	54	49	S-E	2 16 59.325	79 54 22.38W	2	14	15	-1.4	1.1
47	1148	65	36	N-E	2 17 1.565	79 54 21.36W	2	36	17	-1.5	1.3
47	1240	65	24	N-W	2 17 0.245	79 54 20.10W	2	28	12	0.5	-2.4
47	1436	63	43	N-W	2 17 1.145	79 54 21.42W	2	26	7	1.4	1.0
47	1436	63	43	N-W	2 17 1.145	79 54 21.42W	2	26	7	1.4	1.0
47	1728	64	26	N-E	2 16 58.025	79 54 16.39W	2	11	5	-1.7	-1.1
47	1822	42	21	N-E	2 17 1.145	79 54 20.34W	2	24	5	1.4	-0.1
47	1910	64	65	N-W	2 17 2.045	79 54 18.90W	2	23	2	2.3	-1.5
47	2018	42	32	N-W	2 17 0.125	79 54 22.09W	2	30	2	0.4	1.5
47	2124	54	27	N-E	2 17 1.225	79 54 20.45W	2	30	14	-1.5	-0.5
47	2232	63	17	S-E	2 16 58.445	79 54 21.72W	2	23	10	-1.3	1.3
47	2232	63	25	N-W	2 17 1.805	79 54 21.00W	2	20	14	0.5	0.5
48	18	65	32	S-W	2 16 57.425	79 54 17.40W	2	28	13	-2.3	-3.1
48	608	42	11	S-E	2 16 57.725	79 54 19.70W	2	17	9	-2.0	-1.2
48	212	53	71	S-W	2 17 0.725	79 54 16.78W	2	30	1	1.2	-1.7
48	746	42	72	S-E	2 16 57.425	79 54 20.50W	2	33	0	-2.1	0.0
48	750	42	56	S-W	2 16 58.845	79 54 16.72W	2	34	17	-0.1	-0.1
48	834	64	7	N-E	2 17 16.065	79 54 20.57W	2	7	5	16.3	0.1
48	910	54	14	S-E	2 17 15.025	79 54 22.57W	2	23	11	-0.2	-0.2
48	1008	65	12	N-E	2 17 1.145	79 54 22.57W	2	23	11	-1.4	-4.2
48	1056	54	43	S-E	2 17 57.045	79 54 16.00W	2	34	15	-1.0	-2.5
48	1160	65	62	N-E	2 17 1.505	79 54 16.00W	2	35	15	-1.4	-1.6
48	1164	63	67	N-E	2 17 0.165	79 54 22.74W	2	34	16	0.0	-2.1
48	1166	63	8	N-E	2 17 2.925	79 54 22.62W	2	5	1	3.1	-57.9
48	1622	44	45	N-E	2 17 1.605	79 54 21.54W	2	34	16	2.0	1.4
48	1622	42	72	N-E	2 17 2.225	79 54 21.46W	2	6	0	2.5	3.0
48	2010	64	15	N-W	2 17 1.325	79 54 21.54W	2	18	1	2.2	1.4
48	2110	42	7	N-W	2 16 50.705	79 54 24.78W	2	1	0	-6.1	4.3
48	2228	64	76	N-W	2 17 1.805	79 54 18.54W	5	32	0	2.0	-1.0
48	2330	65	84	S-E	2 16 56.705	79 54 38.10W	2	30	1	-3.1	17.6
49	122	63	42	S-E	2 16 59.405	79 54 21.24W	2	32	10	-0.4	0.8

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13A-2  
F/V KANA KEOKI 1973 POSITIONAL DATA, GUAYAQUIL, ECUADOR,  
PORT SIDE TO BERTH NO. 2, PUERTO MARITIMO, STERN 13 METERS BEYOND END.

DAY	GMT	SAT	ELEV	GFCM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
49	310	63	17	S-W	2 16 59.585	79 54 18.42W	2	20	4	-0.2	-2.0
49	602	64	28	S-E	2 16 57.705	79 54 21.54W	2	30	14	-1.6	1.4
49	656	42	45	S-E	2 16 59.745	79 54 20.50W	2	21	6	-1.0	0.4
49	746	64	26	S-W	2 16 59.585	79 54 18.66W	2	30	14	-0.9	-2.4
49	844	42	15	S-W	2 16 59.465	79 54 19.00W	2	22	10	0.4	-0.7
49	1004	54	65	S-E	2 16 59.885	79 54 20.60W	2	33	0	0.1	-0.6
49	1104	65	43	N-E	2 17 0.125	79 54 19.10W	2	18	18	0.0	-0.6
49	1152	54	6	S-W	2 20 25.325	79 54 24.66W	4	11	5	20.6	-18.0
50	2P	65	20	S-W	2 17 0.125	79 54 20.50W	3	24	10	0.4	0.1
50	220	63	49	S-W	2 16 59.745	79 54 23.50W	2	25	5	0.9	3.4
50	214	64	8	S-E	2 17 13.345	79 54 21.18W	2	7	13.5	0.7	-0.4
50	202	42	13	S-E	2 17 2.605	79 54 20.54W	2	20	9	-0.9	-3.1
50	206	71	2	S-W	2 16 50.045	79 54 17.34W	2	35	17	-0.7	-3.1
50	914	44	22	S-E	2 16 57.845	79 54 19.40W	2	2	2	-1.0	-1.1
50	1016	65	22	N-E	2 17 2.585	79 54 22.54W	2	29	14	2.4	2.2
50	1058	44	32	S-W	2 16 57.925	79 54 19.62W	2	32	16	-0.4	-0.6
50	1204	65	43	N-E	2 17 1.165	79 54 18.72W	2	33	15	2.1	-1.7
50	1354	63	64	N-E	2 16 47.245	79 54 24.56W	3	29	0	-12.5	-147.3
50	1532	64	69	N-E	2 17 1.085	79 54 24.56W	3	35	17	1.3	4.4

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 13B-2

ARITHMETIC MEAN SOLUTION, GUAYAQUIL, NO. 2, STEPN 13 METERS EXTENDED.

NO	N	NSD	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
			LONGITUDE	(SECONDS)	(SECONDS)
60	19	45	2 16 59.765 79 54 20.46W	2.1 2.3	0.3 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>10 SECS OF ARC
46	2114	X		
46	2224		X	
47	14	X		X
47	110	X		
47	1140	X		
47	1436			
47	1728	X		X
48	628	X		
48	938	X		X
49	1049	X		
49	1536	X		X
49	1022		X	
49	2110	X		
49	2228		X	
49	2330		X	X
49	1152	X		
50	514	X		X
50	602	X		
50	1354			X

TABLE 13C-2

BY SATELLITE, MEAN SOLUTION, GUAYAQUIL, NO. 2, STEPN 13 METERS EXTENDED.

SATELLITE	NO	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
NUMBER		LONGITUDE	(SECONDS)	(SECONDS)
42	8	2 16 54.225 79 54 19.99W	1.0 1.8	0.3 0.7
54	8	2 16 59.825 79 54 19.99W	1.0 1.8	0.3 0.7
63	7	2 16 54.875 79 54 20.01W	1.0 2.0	0.4 0.4
64	12	2 16 59.215 79 54 20.53W	3.0 1.8	0.2 0.5
65	10	2 16 55.825 79 54 20.27W	1.1 1.8	0.4 0.5

TABLE 13A-3

F/V KANA KECKI 1973 POSITIONAL DATA, GUAYAQUIL, ECUADOR,  
PORT SIDE TO CARIBBEAN TIUNA, PUERTO MARITIMO.

DAY	GMT	SAT	ELEV	SEC/N	LATITUDE	LONGITUDE	IT	CTS	CTS	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
50	2022	64	6	N-E	2 17 1.385	79 54 24.42W	2	6	2	3.3	0.8
* 50	2050	64	11	S-E	2 16 58.025	79 54 22.44W	4	15	7	-0.1	-1.3
* 50	2156	65	7	S-E	2 17 5.005	79 54 21.12W	4	12	0	7.3	-0.4
50	2232	64	50	N-W	2 16 57.765	79 54 21.12W	2	34	8	1.5	-2.8
50	2240	64	52	S-W	2 16 57.245	79 54 21.12W	2	22	16	-0.3	-2.1
* 51	132	63	61	S-E	2 17 8.245	79 54 24.42W	2	31	11	10.9	-14.2
* 51	222	63	11	S-W	2 17 5.115	79 54 24.42W	2	15	4	4.3	-1.3
* 51	626	64	22	S-E	2 16 57.345	79 54 22.42W	2	34	17	-0.2	-1.2
* 51	629	64	20	S-E	2 16 57.005	79 54 22.42W	2	34	16	-1.1	-1.3
* 51	728	64	16	S-W	2 16 57.245	79 54 22.42W	3	20	6	-0.3	-1.0
* 51	740	64	13	S-E	2 16 57.245	79 54 21.00W	2	18	6	-2.9	-1.0
* 51	1328	64	71	S-E	2 16 57.165	79 54 25.43W	3	22	0	-2.0	4.9
* 51	1114	65	77	N-E	2 16 54.745	79 54 22.42W	2	15	1	0.4	8.9
* 51	1158	64	7	S-W	2 17 17.765	79 54 24.75W	0	0	0	-10.6	-1.1
* 51	1306	65	5	N-W	2 16 38.225	79 54 19.92W	6	0	0	-10.3	-1.0
51	1600	63	19	N-W	2 17 0.725	79 54 25.43W	3	13	1	2.8	1.8
51	1744	64	21	N-E	2 16 58.325	79 54 24.75W	2	28	13	8.6	1.0
51	1826	62	26	N-F	2 15 58.625	79 54 23.22W	2	27	13	0.6	-0.4
51	1730	64	29	N-W	2 15 58.185	79 54 23.10W	2	26	7	0.3	-0.6
51	2140	64	48	N-E	2 16 52.165	79 54 25.74W	2	34	17	1.0	2.1
51	2242	65	43	S-E	2 16 55.325	79 54 22.42W	2	30	14	-2.8	-0.9
* 51	2326	64	14	N-W	2 16 37.505	79 54 33.10W	3	21	0	-20.6	3.5

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 13B-3  
ARITHMETIC MEAN SOLUTION, GUAYAQUIL, PORT SIDE TO CARIBBEAN TIUNA.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
22	10	12	2 16 59.11S 79 54 23.66W	1.6 2.1	0.4 0.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>5
50	2022	X		
50	2050	X		
50	2100	X		
51	132			X
51	322	X	X	
51	940	X		
51	1114		X	
51	1158	X	X	X
51	1396	X	X	X
51	2328	X		X

TABLE 13C-2  
BY SATELLITE, MEAN SOLUTION, GUAYAQUIL, PORT SIDE TO CARIBBEAN TIUNA.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	2 16 57.84S 79 54 22.92W	1.2 0.4	0.9 0.3
54	3	2 16 58.48S 79 54 22.32W	1.4 1.1	0.9 0.6
63	1	2 16 57.00S 79 54 22.62W		
64	4	2 16 57.90S 79 54 23.85W	1.6 2.2	0.9 1.6
65	2	2 16 57.84S 79 54 22.92W	1.2 0.4	0.9 0.3

TABLE 13A-4  
P/V KANA KEOKI 1973 POSITIONAL DATA, GUAYAQUIL, ECUADOR,  
PORT SIDE TO BERTH NO. 6, PUERTO MARITIMO.

DAY	GMT	SAT	ELEV	GFCM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
65 1848	64	22	N-W	2 16 43.62S	79 54 43.44W	4	24	8	-0.2	-1.2	
* 65 1946	42	12	N-W	2 16 46.39S	79 54 44.04W	2	18	9	2.5	-0.6	
65 2020	54	30	N-E	2 16 43.62S	79 54 46.50W	2	31	15	-0.2	1.9	
65 2208	54	24	N-W	2 16 44.34S	79 54 43.86W	2	28	10	0.5	-0.7	

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 13B-4  
ARITHMETIC MEAN SOLUTION, GUAYAQUIL, PCRT SIDE TO BERTH NO. 6.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
4	1	3	2 16 43.86S 79 54 44.60W	0.4 1.7	0.2 1.0

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>5
65	1946		X	>10 SECS OF ARC

TABLE 13C-4

BY SATELLITE, MEAN SOLUTION, GUAYAQUIL, PCRT SIDE TO BERTH NO. 6.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
54	2	2 16 43.98S 79 54 45.14W	0.5 1.9	0.4 1.3

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TABLE 14B-1  
P/V KANA KOKI 1972 POSITIONAL DATA, PUNTARENAS, COSTA RICA  
SWINGING AT ANCHOR, BUT NOT DRAGGING

DAY	GMT	SAT	ELEV	GFOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
122	1830	54	27	N-E	9 57 51.36N	84 49 27.66W	3	29	14	+0.0	+1.3
122	2015	54	26	N-W	9 57 49.98N	84 49 27.90W	2	22	6	-1.3	+1.5
122	2204	63	41	S-W	9 57 51.24N	84 49 26.56W	2	32	16	-0.1	-0.4
123	115	42	13	S-E	9 57 54.12N	84 49 23.78W	2	19	7	+0.6	-2.6
123	240	44	52	S-E	9 57 52.32N	84 49 25.04W	2	34	16	+1.2	-1.3
123	300	42	50	S-W	9 57 51.54N	84 49 23.94W	2	33	15	+0.2	-2.4
123	422	64	13	S-W	9 57 48.00N	84 49 27.24W	2	19	7	-3.3	0.9
123	600	54	14	S-E	9 57 48.38N	84 49 24.52W	2	18	3	-1.1	0.1
123	618	65	40	N-E	9 57 50.10N	84 49 27.48W	2	32	15	+1.1	-1.1
123	734	44	1	S-E	9 57 50.10N	84 49 26.58W	2	35	17	+0.3	-0.2
123	804	63	12	N-E	9 57 51.66N	84 49 26.22W	3	17	6	-0.4	-0.2
123	846	43	62	N-E	9 57 49.98N	84 49 25.29W	2	16	13	-0.6	-1.1
123	1256	42	7	N-E	9 57 50.30N	84 49 25.62W	1	0	0	-3.6	-0.4
123	1420	64	35	N-E	9 57 50.00N	84 49 25.98W	2	33	16	-1.3	-0.2
123	1440	42	76	N-W	9 57 50.34N	84 49 19.32W	2	30	1	-1.0	-7.1
123	1608	64	20	N-W	9 57 53.64N	84 49 25.02W	2	23	2	+2.3	-1.4
123	1742	54	7	N-E	9 57 47.40N	84 49 23.70W	3	0	0	-3.9	-2.7
123	1924	54	77	N-W	9 57 50.70N	84 49 20.10W	2	34	17	-0.6	-6.3
123	2116	63	71	S-E	9 57 51.42N	84 49 29.28W	2	31	13	+0.2	2.9

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 14B-1  
ARITHMETIC MEAN SOLUTION AT PUNTARENAS - ANCHORED

NF	N	NSD	LATITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
19	8	11	9 57 51.33N	1.1	0.3
			84 49 26.39W	1.6	0.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION >10 SECs OF ARC
			<15	>75	
123	115	X			
123	424	X			
123	600	X			
123	874	X			
123	1256	X			
123	1440	X			
123	1742	X			
123	1924	X			

TABLE 14C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT PUNTA ARENAS - ANCHORED

SATELLITE NUMBER	NSD	LATITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	9 57 51.54N 84 49 23.94W		
54	3	9 57 50.36N 84 49 26.50W	0.9 2.2	0.5 1.3
63	3	9 57 50.96N 84 49 26.50W	0.9 2.2	0.5 1.3
64	3	9 57 50.96N 84 49 26.50W	0.9 2.2	0.5 1.3

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TABLE 15A-1  
R/V KANA KEOKI 1972 POSITIONAL DATA, ACAPULCO, MEXICO  
DOCKED AT DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
132	1925	54	30	N-E	16 50 52.14N	99 54 15.66W	2	12	2	-1.6	0.1
*132	1926	65	76	S-W	16 50 52.44N	99 54 36.64W	3	31	8	-1.3	-35.0
132	2046	64	24	N-W	16 50 49.56N	99 54 15.00W	2	10	3	-4.2	-2.8
*132	2102	63	26	S-E	16 51 0.40N	99 54 26.76W	2	25	5	6.9	10.9
*132	2246	63	24	S-W	16 51 0.18N	99 54 45.74W	2	22	2	6.4	-11.1
*133	242	42	65	S-E	16 50 56.34N	99 54 30.30W	2	29	13	2.5	14.4
*133	326	64	87	S-W	16 50 41.76N	99 54 36.05W	3	30	0	-12.0	-218.7
*133	430	42	10	S-E	16 50 55.76N	99 54 16.52W	2	10	3	12.9	-4.0
*133	616	64	15	S-E	16 50 52.68N	99 54 16.54W	2	11	1	-1.1	-1.2
133	712	75	60	N-E	16 50 53.10N	99 54 11.34W	2	11	1	-3.7	-6.5
133	804	64	51	S-W	16 50 54.72N	99 54 13.52W	2	19	7	-1.2	-2.4
133	850	61	23	N-E	16 50 52.20N	99 54 17.67W	2	21	7	-1.6	-1.0
133	1034	73	37	N-W	16 50 53.24N	99 54 14.64W	2	20	5	-0.1	-1.2
133	1426	42	46	N-E	16 50 53.34N	99 54 17.16W	2	13	0	-0.4	1.3
*133	1512	64	70	N-E	16 50 51.00N	99 54 38.29W	2	32	15	-2.8	22.4
133	1614	42	15	S-W	16 50 52.32N	99 54 10.74W	2	15	4	-1.4	-5.1
*133	1700	64	9	N-W	16 51 1.68N	99 54 10.68W	3	10	3	7.9	-5.2
132	1638	65	41	S-E	16 50 55.26N	99 54 14.22W	2	18	2	1.5	-1.6
133	1646	54	44	N-W	16 50 53.34N	99 54 25.74W	2	12	0	-0.4	9.9
133	2026	65	19	S-W	16 50 57.90N	99 54 7.50W	2	24	12	4.1	-9.4

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 15E-1  
ARITHMETIC MEAN SOLUTION AT ACAPULCO - DOCKED

NO	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
20	8	12	16 50 53.76N 99 54 15.66W	3.1 5.6	0.9 1.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION >10 SECS OF ARC
			<15	>75	
132	1925			X	X
132	2248				X
133	242				X
133	326		X	X	X
133	430		X		X
133	614			X	X
133	1512				X
133	1700		X	X	

TABLE 15C-1  
BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT ACAPULCO - DOCKED

SATELLITE	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	16 50 52.83N 99 54 13.05W	0.7 4.5	0.5 3.2
54	4	16 50 51.84N 99 54 14.73W	1.6 2.9	0.9 1.4
63	3	16 50 52.60N 99 54 14.62W	0.6 3.4	0.4 2.0
65	3	16 50 52.60N 99 54 14.62W	0.6 3.4	0.4 2.0

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TABLE 15A-2  
R/V KANA KEOKI 1972 POSITIONAL DATA, ACAPULCO, MEXICO  
MOORED AT DOCK, 60 METERS WEST OF POSITION ON DAYS 132 - 133.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)					
							IT	CTS	CTS0	LATITUDE	LONGITUDE	
133	2200	63	71	S-E	16 50 54.12N	99 54 13.26W	2	24	1	-0.5	-35.9	
134	150	42	20	S-E	16 51 1.38N	99 54 20.82W	2	29	0	6.7	1.7	
134	238	64	35	S-E	16 51 1.92N	99 54 23.82W	2	29	14	7.3	4.7	
*134	334	42	37	S-W	15 50 58.74N	99 54 16.94W	2	27	1	4.1	-10.2	
134	424	64	23	S-W	16 50 57.00N	99 54 11.70W	2	27	14	2.3	-7.5	
134	628	65	32	N-E	16 50 53.58N	99 54 17.54W	2	20	4	-1.1	-1.2	
134	712	56	58	S-E	16 50 54.18N	99 54 19.80W	2	34	17	-0.5	0.5	
134	812	65	27	N-E	16 50 53.10N	99 54 16.50W	2	20	6	-1.6	-2.7	
*134	900	54	13	S-W	16 50 57.46N	99 54 14.74W	2	21	10	-1.2	-5.4	
*134	948	43	69	N-E	16 50 51.06N	99 54 37.02W	1	19	0	-3.5	17.7	
*134	1332	42	14	N-E	16 50 49.74N	99 54 21.16W	1	17	6	-4.9	-1.2	
*134	1420	64	24	N-E	16 50 43.22N	99 54 32.28W	2	12	11	-1.4	13.1	
134	1514	42	52	N-W	16 50 42.92N	99 54 17.46W	2	22	1	-1.7	-1.7	
134	1610	64	33	N-W	16 50 38.60N	99 54 10.18W	2	28	1	-0.1	-0.1	
134	1752	65	15	S-E	16 50 34.88N	99 54 21.88W	2	20	10	8.5	9.3	
*136	2054	54	13	N-W	16 51 11.34N	99 54 14.10W	10	8	0	16.7	-5.1	
*136	2120	63	56	C-E	16 50 45.46N	99 54 39.96W	2	23	9	1.2	21.9	
137	200	64	15	S-E	16 50 50.58N	99 54 26.24W	2	23	11	-4.1	7.2	
137	346	64	40	S-W	16 50 54.24N	99 54 17.50W	2	10	0	-0.1	-2.4	
137	548	65	18	N-E	16 50 50.20N	99 54 11.68W	2	22	10	-3.7	-7.3	
137	626	64	27	S-E	16 50 52.12N	99 54 15.70W	2	27	7	-2.5	-3.4	
137	730	65	46	N-E	16 50 52.88N	99 54 16.68W	2	26	0	-1.8	0.5	
137	812	64	30	S-E	16 50 54.66N	99 54 14.24W	2	11	0	0.0	-1.0	
137	904	63	47	N-E	16 50 54.76N	99 54 14.34W	2	33	16	-0.6	0.2	
137	1054	63	17	N-E	16 50 50.82N	99 54 15.90W	2	20	4	-3.8	-3.3	
*137	1246	64	13	N-E	16 50 55.10N	99 54 21.30W	4	20	0	1.3	2.1	
137	1416	62	56	N-E	16 50 58.32N	99 54 24.50W	2	34	17	-1.3	5.7	
*137	1430	64	55	N-W	16 50 55.50N	99 54 7.00W	2	32	16	0.9	-11.4	
*137	1510	64	19	N-E	16 50 56.46N	99 54 22.00W	2	23	7	1.9	14.4	
*137	1558	65	80	S-E	16 51 15.48N	99 54 11.76W	14	23	0	20.8	29.6	
* = FIX NOT USED FOR COMPUTATION OF THE MEAN												

TABLE 15A-2  
R/V KANA KEOKI 1972 POSITIONAL DATA, ACAPULCO, MEXICO  
MOORED AT DOCK, 60 METERS WEST OF POSITION ON DAYS 132 - 133.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)					
							IT	CTS	CTS0	LATITUDE	LONGITUDE	
139	816	63	17	N-E	16 50 52.68N	99 54 18.60W	2	0	0	-2.0	-0.6	
*139	832	65	11	N-W	16 50 44.20N	99 54 16.30W	1	0	0	-10.4	-0.4	
139	1002	63	47	N-W	15 50 54.60N	99 54 18.50W	2	22	6	-0.1	-6.0	
139	1228	42	18	N-E	16 50 49.56N	99 54 19.20W	2	15	4	-5.1	0.0	
* = FIX NOT USED FOR COMPUTATION OF THE MEAN												

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TABLE 15C-2

			ARITHMETIC MEAN SOLUTION AT ACAPULCO - 60 M WEST		
NP	N	NSC	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
			LONGITUDE	(SECONDS)	(SECONDS)
47	21	26	16 50 54.65N	3.4	0.7
			99 54 19.16W	4.9	1.0

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>5
133	2200			x
134	334			x
134	900	x		
134	068		x	x
134	1312	x		x
134	1410		x	x
136	2054	x		x
136	2120			x
137	1346	x		
137	1510			x
137	1810			x
137	1454	x	x	x
138	256	x		x
138	324			x
138	1630	x		x
138	1904			x
139	2128			x
139	232	x		x
139	354			x
139	720	x		x
139	932	x		x

TABLE 15C-2  
BY SATELLITE ---- ARITHMETIC MEAN SOLUTION AT ACAPULCO - 60 M WEST

SATELLITE NUMBER	NSC	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
		LONGITUDE	(SECONDS)	(SECONDS)
42	4	16 50 54.30N 99 54 20.61W	5.0 3.2	2.5 1.6
64	3	16 50 55.80N 99 54 21.08W	4.8 3.7	2.9 2.1
63	4	16 50 54.30N 99 54 20.61W	5.0 3.2	2.5 1.6
54	6	16 50 54.75N 99 54 19.67W	4.1 3.1	1.7 1.1
65	9	16 50 54.23N 99 54 18.73W	3.5 3.1	1.2 1.0

TABLE 15A-3  
P/V KANA KECKI 1974 POSITIONAL DATA, ACAPULCO, MEXICO.  
HOOTED TO MAIN PIER

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
195	1102	42	2F	N-E	16 50 52.62N	99 54 15.04W	2	27	13	-0.3	1.8
195	1148	54	A1	N-W	16 50 54.66N	99 54 20.22W	3	23	0	0.8	3.0
195	1248	42	27	N-W	16 50 53.22N	99 54 17.46W	2	27	7	-0.6	0.2
195	1548	65	65	S-E	16 50 53.00N	99 54 13.39W	3	11	0	0.1	-3.9
195	1710	63	45	S-E	16 50 53.80N	99 54 16.02W	2	13	1	0.0	-1.2
195	1816	99	53	N-E	16 50 50.76N	99 54 11.88W	3	33	16	-23.1	-185.4

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 15B-3  
ARITHMETIC MEAN SOLUTION, ACAPULCO, MAIN PIER

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
6	1	5	16 50 53.24N 99 54 17.23W	0.5 2.7	0.2 1.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>5
195	1816			>10 SECS OF ARC

X

TABLE 15C-3  
BY SATELLITE, MEAN SOLUTION, ACAPULCO, MAIN PIER.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	16 50 53.37N 99 54 18.27W	0.2 1.1	0.2 0.8
54	1	16 50 53.52N 99 54 19.08W		
63	1	16 50 53.52N 99 54 19.08W		

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TABLE 16A-1  
R/V KARA KROK 1972 POSITIONAL DATA, SAND ISLAND, MIDWAY  
MOORED TO THE MAIN PIER.

DAY	GMT	SAT	ELEV	GECM	LATITUDE	LONGITUDE	IT	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)			
								CTS	CTSQ	LATITUDE	LONGITUDE
203	222	42	20	S-E	28 12 49.14N	177 21 47.22W	*	0	0	-1.2	-1.2
203	334	64	66	S-E	28 12 51.54N	177 21 48.00W	2	0	0	1.5	-0.4
203	478	42	46	S-W	28 12 49.32N	177 21 47.22W	2	0	0	-1.0	-1.2
*203	51P	64	13	S-W	28 12 52.50N	177 21 49.02W	2	0	0	2.1	2.6
*203	604	65	7	N-E	28 13 3.78N	177 21 51.72W	2	0	0	13.4	3.3
203	642	54	23	S-E	28 12 48.60N	177 21 46.80W	2	0	0	-1.8	-1.4
*203	748	65	77	N-E	28 12 49.80N	177 21 50.52W	3	0	0	-0.6	2.1
203	810	54	39	S-W	28 12 49.50N	177 21 48.42W	2	0	0	-0.4	0.0
*203	938	65	8	N-W	28 13 1.98N	177 21 43.08W	3	0	0	11.6	-5.3
203	1022	63	73	N-E	28 12 48.78N	177 21 53.78W	4	0	0	-1.8	5.4
203	1558	42	56	N-W	28 12 50.40N	177 21 46.66W	2	0	0	0.2	-1.5
203	1710	64	16	N-W	28 12 47.52N	177 21 50.10W	2	0	0	-2.8	1.7
203	1834	54	15	N-E	28 12 49.44N	177 21 46.56W	2	0	0	-0.0	-1.3
203	1904	55	37	S-E	28 12 51.90N	177 21 47.10W	2	0	0	1.8	-1.3
203	2018	64	50	N-W	28 12 50.46N	177 21 46.70W	2	0	0	0.1	-1.6
203	2052	65	26	S-E	28 12 51.48N	177 21 49.44W	2	0	0	1.1	-1.0
203	2138	63	39	S-E	28 12 51.78N	177 21 48.12W	2	0	0	1.6	-0.3
203	2324	63	58	S-W	28 12 53.16N	177 21 49.58W	2	0	0	2.8	1.8

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 16B-1  
ARITHMETIC MEAN SOLUTION AT MIDWAY

NF	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
18	5	17	28 12 50.37N 177 21 48.40W	1.6	0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS <15 >75	DEVIATION	
				>5	>10 SECS OF ARC
203	222			X	
203	518	X			
203	604	X			X
203	748		X		
203	938	X			X

TABLE 16C-1  
ARITHMETIC MEAN SOLUTION BY SATELLITE AT MIDWAY

SATELLITE NUMBER	NEC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	28 12 49.84N 177 21 47.00W	0.8 0.3	0.5 0.2
54	4	28 12 49.57N 177 21 47.32W	0.9 0.9	0.4 0.4
63	3	28 12 49.44N 177 21 46.96W	0.9 0.2	0.5 0.1
64	2	28 12 49.86N 177 21 47.04W	0.8 0.3	0.5 0.2
65	2	28 12 49.86N 177 21 47.04W	0.8 0.3	0.5 0.2

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TABLE 17A-1  
F/V KANA KOKI 1973 POSITIONAL DATA, PAPETE, TAHITI.  
MCCRED PORT SIDE TC NORTH END OF MAIN WHARF.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
21	104	64	56	N-E	17 32 2.64S	149 34 21.69W	2	31	15	1.1	0.1
21	126	42	50	N-E	17 32 2.40S	149 34 21.42W	2	33	16	0.9	-0.4
21	1248	64	42	S-E	17 32 0.12S	149 34 22.74W	2	34	17	-1.4	0.9
21	1310	42	36	S-E	17 32 1.26S	149 34 21.66W	2	32	15	-0.2	-0.1
21	1436	64	19	S-W	17 31 59.58S	149 34 20.70W	2	26	12	-1.9	-1.1
21	1456	42	22	S-W	17 32 3.00S	149 34 22.01W	3	28	13	2.4	0.3
21	1622	54	44	S-E	17 32 0.60S	149 34 22.08W	2	34	17	-0.4	0.3

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 17E-1  
ARITHMETIC MEAN SOLUTION AT PAPETE, MAIN WHARF

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
7	0	7	17 32 1.50S 149 34 21.80W	1.5 0.6	0.4 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY    GMT    ELEVATION    ITERATIONS    DEVIATION  
      <15    >75        >5        >10 SECS OF ARC

TABLE 17C-1

BY SATELLITE --- ARITHMETIC MEAN SOLUTION AT PAPETE, MAIN WHARF					
SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)	
42	3	17 32 2.52S 149 34 21.72W	1.3 0.3	0.9 0.2	
54	1	17 32 2.40S 149 34 21.42W			
64	3	17 32 2.52S 149 34 21.72W	1.3 0.3	0.9 0.2	

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TABLE 17A-2  
R/V KANA KECKI 1973 POSITIONAL DATA, PAPETE, TAHITI.  
ACCRED AT THE FUEL DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
151	1634	65	24	N-E	17 32 14.76S	149 34 11.08W	2	26	9	0.5	1.2
151	1638	63	43	N-F	17 32 14.62S	149 34 11.10W	22	30	6	1.2	0.4
151	1644	63	200	N-W	17 32 15.00S	149 34 11.06W	22	23	6	1.2	-1.2
• 151	1622	64	77	N-F	17 32 20.16S	149 34 10.94W	24	30	6	6.4	80.0
• 151	1626	64	54	N-E	17 32 14.76S	149 34 11.10W	2	30	14	2.5	0.4
• 151	1620	64	7	N-W	17 31 57.16S	149 34 12.00W	4	0	-	-16.3	2.2
• 151	1654	62	14	N-W	17 32 13.28S	149 34 11.08W	2	19	8	-6.3	-1.2
• 151	1626	54	63	N-F	17 32 14.36S	149 34 11.59W	22	33	16	0.7	2.9
• 151	2034	65	25	S-E	17 32 14.46S	149 34 10.56W	22	26	12	0.2	-0.1
• 151	2114	54	11	N-W	17 32 17.22S	149 34 0.68W	22	15	5	3.0	-1.6
• 151	2220	65	27	S-W	17 32 13.90S	149 34 9.60W	2	26	6	-0.4	-1.1
• 151	2302	63	31	S-E	17 22 13.96S	149 34 5.36W	2	30	14	-0.2	-1.3
152	4P	63	25	S-W	17 32 13.44S	149 34 10.14W	2	25	9	-0.8	-0.5
152	416	64	68	S-E	17 32 12.54S	149 34 12.62W	2	36	17	-1.7	1.7
152	446	42	36	S-E	17 32 13.28S	149 34 10.14W	2	33	16	-1.0	-0.5

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 17B-2  
ARITHMETIC MEAN SOLUTION, TAHITI, FUEL DOCK

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
15	4	11	17 32 14.22S 149 34 10.69W	0.9 1.0	0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS >5	DEVIATION >10 SEC'S OF ARC	
				X	X
151	1632		X	X	X
151	1620		X	X	X
151	1654		X		
151	2114		X		

TABLE 17C-2  
BY SATELLITE, MEAN SOLUTION, TAHITI, MAIN WHARF 7777777

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	17 32 14.01S 149 34 10.62W	1.1 0.7	0.8 0.5
54	1	17 32 14.76S 149 34 11.10W		
63	4	17 32 14.59S 149 34 10.98W	0.0 0.6	0.5 0.3
64	1	17 32 14.76S 149 34 11.10W		
65	4	17 32 14.59S 149 34 10.98W	0.9 0.6	0.5 0.3

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TABLE 18A-1  
R/V KANA KEKII 1973 POSITIONAL DATA,  
MCCRED PORT SIDE TO SITIO NO. 2.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
91	218	64	21	S-E	23 39 12.30S	70 24 18.04W	2	24	11	-1.4	-1.6
91	400	42	67	S-E	23 39 13.86S	70 24 18.74W	5	20	0	0.2	-1.6
91	548	42	9	S-W	23 39 12.40S	70 24 20.76W	2	11	4	1.7	0.4
91	612	54	43	S-E	23 39 12.66S	70 24 19.40W	2	20	13	-1.0	-2.3
91	722	65	32	N-E	23 39 14.16S	70 24 20.59W	2	28	14	0.5	0.5
91	758	64	19	S-W	23 39 11.82S	70 24 22.26W	2	26	12	-1.9	1.0
91	806	65	26	N-E	23 39 15.18S	70 24 20.46W	2	28	11	1.5	0.1
91	1032	63	67	N-E	23 39 15.50S	70 24 20.86W	6	28	0	1.0	0.2
91	1218	63	7	N-E	23 39 0.94S	70 24 22.50W	5	4	1	-3.7	2.1
91	1420	42	34	N-F	23 39 13.56S	70 24 21.10W	2	21	14	-0.1	0.4
91	1704	42	26	N-W	23 39 14.04S	70 24 20.58W	2	29	14	0.3	0.5
91	1732	54	22	N-E	23 39 14.70S	70 24 20.40W	2	27	13	1.0	-0.3
91	1910	65	30	S-E	23 39 13.20S	70 24 18.73W	2	33	15	-2.5	-1.2
91	2054	65	35	S-W	23 39 12.66S	70 24 21.60W	2	35	17	-1.0	1.1
91	2220	63	74	S-E	23 39 12.24S	70 24 19.76W	3	26	1	-1.5	-1.1
92	6	63	10	S-W	23 39 0.96S	70 24 23.46W	2	16	7	-3.7	3.1
92	368	42	27	S-E	23 39 13.80S	70 24 18.72W	2	24	11	0.1	-1.7
92	452	42	32	S-W	23 39 12.60S	70 24 21.52W	2	31	14	-1.1	1.8
92	522	94	15	S-E	23 39 12.62S	70 24 16.50W	2	21	12	-0.9	-0.9
92	626	65	11	N-E	23 39 11.28S	70 24 18.76W	2	14	17	-2.4	-1.4
92	704	54	82	S-E	23 39 11.10S	70 24 21.74W	2	34	17	-2.6	1.4
92	716	65	82	N-E	23 39 15.24S	70 24 20.11W	2	34	15	1.6	0.7
92	742	63	12	N-E	23 39 13.74S	70 24 20.70W	2	14	14	0.0	0.3
92	1030	65	7	N-W	23 39 42.12S	70 24 35.86W	0	0	0	-2.8	15.7
92	1128	63	26	N-E	23 39 15.72S	70 24 20.28W	2	26	11	2.2	-2.1
92	1434	64	39	N-F	23 39 13.82S	70 24 20.24W	2	26	11	0.1	-2.7
92	1612	42	73	N-W	23 39 15.90S	70 24 23.14W	2	15	0	2.2	2.1
92	1623	64	23	N-W	23 39 16.14S	70 24 21.66W	2	28	0	2.4	1.6
92	1756	42	7	N-W	23 39 16.44S	70 24 26.17W	2	0	0	2.7	4.2
92	1826	65	11	S-E	23 39 10.44S	70 24 17.14W	6	17	4	-1.3	-2.5
92	2004	65	72	S-W	23 39 11.04S	70 24 24.17W	6	30	1	-3.7	3.3
92	2132	63	29	S-E	23 39 13.62S	70 24 17.73W	2	25	8	-0.1	-2.7
92	2156	65	8	S-W	23 39 17.82S	70 24 18.50W	2	9	3	4.2	-1.4
92	2218	63	31	S-W	23 39 13.26S	70 24 21.04W	2	24	3	-0.4	1.4
93	226	64	31	S-F	23 39 12.42S	70 24 18.30W	2	25	10	-1.3	-2.1
93	356	42	66	S-E	23 39 12.06S	70 24 18.70W	6	0	0	-1.6	-19.6
93	418	64	28	S-W	23 39 12.78S	70 24 21.24W	3	15	1	-0.9	1.4
93	546	42	7	S-W	23 39 16.92S	70 24 24.00W	2	6	1	3.1	4.2
93	614	54	57	S-E	23 39 11.52S	70 24 18.56W	2	34	17	-2.2	-2.3
93	730	65	46	N-E	23 39 14.16S	70 24 21.20W	2	23	15	2.5	1.5
93	802	54	14	S-W	23 39 11.22S	70 24 15.20W	2	21	9	-2.6	-1.1
93	856	63	11	N-E	23 39 14.34S	70 24 20.10W	6	16	7	2.5	-0.3
93	918	65	17	N-W	23 39 14.64S	70 24 21.34W	2	24	11	2.0	3.4
93	1010	63	66	N-W	23 39 14.74S	70 24 15.20W	3	33	15	1.1	-1.1
93	1230	63	7	N-W	23 38 39.54S	70 24 32.20W	7	0	0	-24.2	11.0
93	1336	64	14	S-E	23 39 11.05S	70 24 19.00W	2	14	2	-2.6	-1.1

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 18A-1  
R/V KANA KEKII 1973 POSITIONAL DATA, ANTFCAGASTA, CHILE  
MCCRED PORT SIDE TO SITIO NO. 2.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
93	1516	42	37	N-E	23 39 14.70S	70 24 21.36W	2	28	3	1.0	1.0
93	1536	64	55	N-W	23 39 15.48S	70 24 21.14W	2	24	0	1.4	0.8
93	1702	42	23	N-W	23 39 15.42S	70 24 20.76W	2	28	15	1.7	0.4
93	1734	64	28	N-E	23 39 15.06S	70 24 21.24W	2	0	0	1.4	0.8
93	1918	65	43	S-E	23 39 15.18S	70 24 13.04W	2	0	0	1.5	-7.3
93	2106	65	25	S-W	23 39 11.94S	70 24 20.82W	2	31	15	-1.8	0.4

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 1PE-1  
ARITHMETIC MEAN SOLUTION, ANTOFAGASTA, SITIC NO. 2.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
62	16	36	23 39 13.70S 70 24 20.40W	1.4 2.0	0.2 0.3

ALL PREDICTED PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS		DEVIATION >10 SECS OF ARC
			>5	>10	
91	400			X	X
91	548	X			
91	1012			X	
91	1218	X		X	
92	8	X			
92	636				
92	1008	X			X
92	1758	X			
92	1926	X		X	
92	2156	X			
93	356			X	X
93	646	X			
93	802	X			
93	856	X		X	
93	1230	X		X	X
93	1348	X			

TABLE 18C-1  
BY SATELLITE, MEAN SOLUTION, ANTOFAGASTA, SITIC NO. 2.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	7	23 39 14.29S 70 24 21.06W	1.1 1.3	0.4 0.5
54	7	23 39 14.29S 70 24 21.06W	1.1 1.3	0.4 0.5
63	6	23 39 14.10S 70 24 21.11W	1.1 1.4	0.5 0.6
64	6	23 39 14.10S 70 24 21.11W	1.1 1.4	0.5 0.6
65	11	23 39 13.82S 70 24 20.70W	1.2 1.5	0.4 0.4

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TABLE 19E-1

R/V KANA KEOKI 1973 POSITIONAL DATA, EASTER ISLAND  
SWINGING AT ANCHOR IN COCK BAY, CROSS BEARINGS BY JOHN C. BOSE

DAY	GMT	SAT	ELEV	RECM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
119	1824	54	30	N-E	27 8 31.585	109 26 18.128	2	28	14	1.6	2.7
119	1944	65	23	S-F	27 8 27.245	109 26 17.528	2	30	14	-3.2	-0.9
119	2014	54	31	N-W	27 8 29.825	109 26 16.268	2	19	5	-0.6	-2.2
119	2130	65	44	S-W	27 8 29.745	109 26 16.248	2	36	17	-1.7	-0.2
119	2214	63	38	S-F	27 8 31.445	109 26 17.528	2	30	8	1.0	-0.6
120	22	63	23	S-W	27 8 31.445	109 26 18.128	2	25	12	1.0	-0.3
120	336	64	57	S-F	27 8 32.225	109 26 18.708	2	33	10	1.0	0.4
120	414	42	34	S-C	27 8 32.845	109 26 16.148	2	30	11	-0.4	-2.1
120	524	64	16	S-W	27 8 29.325	109 26 22.028	2	22	11	-1.1	1.4
120	544	42	27	S-W	27 8 32.225	109 26 16.068	2	21	7	1.3	0.5
120	612	54	25	S-E	27 8 31.085	109 26 17.588	2	29	14	0.7	-0.2
120	706	65	7	N-E	27 8 26.705	109 26 17.468	5	0	0	-9.7	-1.0
120	758	54	36	S-W	27 8 29.765	109 26 16.548	2	34	17	-2.7	0.1
120	850	65	73	N-E	27 8 33.185	109 26 20.268	2	30	1	2.0	10.4

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 19E-1  
ARITHMETIC MEAN SOLUTION, EASTER ISLAND, COCK BAY

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
14	2	12	27 8 30.425 109 26 18.438	1.6 1.7	0.5 0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION >10 SECS OF ARC
			<15	>75	
120	706	X		X	
120	850				X

TABLE 19C-1					
BY SATELLITE, MEAN SOLUTION, EASTER ISLAND, COCK BAY.					
SATELLITE	NSD	LATITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN	
NUMBER		LONGITUDE		(SECONDS)	
42	2	27 8 31.535 109 26 17.558	1.0 2.0	0.7	
54	4	27 8 31.215 109 26 19.138	1.1 2.4	0.6	
62	2	27 8 31.535 109 26 17.558	1.0 2.0	0.7	
64	2	27 8 31.535 109 26 17.558	1.0 2.0	0.7	
65	2	27 8 31.535 109 26 17.558	1.0 2.0	0.7	

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TABLE 20A-1  
R/V KANA KEOKI 1973 POSITIONAL DATA, PITCAIRN ISLAND,  
SWINGING AT ANCHOR IN BOUNTY BAY, CROSS BEARINGS BY JOHN ROSE.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
142	1720	42	64	N-E	25 3 53.88S	130 5 36.46W	3	29	14	1.9	0.3
143	1908	54	73	N-N	25 3 52.26S	130 5 38.58W	2	30	14	0.2	2.6
143	1956	65	33	S-E	25 3 51.24S	130 5 38.24W	2	30	14	-2.8	0.1
143	2142	65	24	S-E	25 3 51.72S	130 5 35.82W	2	27	12	-0.3	-0.3
143	2230	63	44	S-E	25 3 51.66S	130 5 33.72W	2	31	14	-0.4	-2.4
144	16	63	19	S-W	25 3 51.42S	130 E 36.18W	2	24	11	-0.6	0.0

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 20B-1  
ARITHMETIC MEAN SOLUTION, PITCAIRN, IN BOUNTY BAY.

NP	N	NSC	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
6	0	E	25 3 52.02S	1.0	0.4

ALL PROBLEM PASSES ARE LISTED BELOW  
DAY GMT ELEVATION ITERATIONS DEVIATION  
<15 >75 >5 >10 SECS OF ARC

TABLE 20C-1  
BY SATELLITE, MEAN SOLUTION, PITCAIRN, IN BOUNTY BAY.

SATELLITE NUMBER	NSD	LATITUDE	STANDARD DEVIATION	STANDARD DEVIATION OF THE MEAN
		LONGITUDE	(SECONDS)	(SECONDS)
42	1	25 3 53.88S		
		130 5 36.44W		
54	1	25 3 53.88S		
		130 5 36.44W		
63	2	25 3 53.07S	1.1	0.9
		130 5 37.53W	1.5	1.0
65	2	25 3 53.07S	1.1	0.8
		130 5 37.53W	1.5	1.3

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TABLE 21A-1  
F/V KANA KEOKI 1974 POSITIONAL DATA,  
SECURED PORT SIDE TO BEARTH NO. 4  
VALPARAISO, CHILE

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
142	1424	54	26	N-E	33 2 0.405	71 27 37.148	2	29	14	+0.9	0.4
*142	2328	42	7	S-E	33 1 56.405	71 27 30.728	2	0	0	-6.1	-0.2
142	2346	64	35	S-E	33 1 59.505	71 27 37.568	2	0	0	-0.9	0.4
143	108	42	67	S-E	33 1 56.705	71 27 33.308	2	0	0	-6.8	-3.4
143	216	54	32	S-E	33 1 59.205	71 27 37.008	2	43	16	-1.2	1.3
*143	248	42	14	S-E	33 2 0.125	71 27 37.148	2	20	10	-0.8	0.4
*143	325	54	10	N-E	33 2 58.445	71 27 37.728	2	18	5	-2.0	0.0
*143	512	65	41	N-E	33 2 52.225	71 27 35.708	3	30	14	-2.3	-1.0
*143	710	53	96	N-E	33 1 56.425	71 27 32.228	2	26	12	-6.7	-1.5
*143	710	63	96	N-E	33 1 52.145	71 27 37.478	2	0	0	-1.6	10.0
143	710	90	60	S-E	33 1 58.365	71 27 36.008	2	26	14	-1.6	1.1
*143	858	43	12	N-E	33 2 1.255	71 27 37.728	2	18	8	-0.6	0.5
*143	920	64	11	N-E	33 2 1.425	71 27 36.008	2	24	4	-1.1	0.2
*143	1106	64	45	N-E	33 2 7.325	71 27 37.688	2	29	0	-6.4	4.0
*143	1144	64	15	N-E	33 2 0.125	71 27 36.248	2	23	10	-6.3	0.6
143	1224	42	29	N-E	33 2 1.265	71 27 36.728	2	30	14	-6.8	0.0
145	2058	59	30	N-E	33 2 2.345	71 27 36.908	2	25	11	-1.9	0.2
145	2124	64	14	S-E	33 1 58.805	71 27 14.508	2	23	11	-1.7	-2.2
145	2305	64	66	S-E	33 1 58.545	71 27 36.768	2	36	18	-1.6	2.0
145	2344	64	18	S-E	33 1 59.825	71 27 35.408	2	26	12	-0.7	-1.3
146	12	42	28	S-E	33 2 0.065	71 27 34.148	2	20	14	-0.4	-2.6
146	128	54	61	S-E	33 1 59.865	71 27 37.928	2	36	18	-1.6	1.2
146	156	42	37	S-E	33 1 59.345	71 27 37.008	2	23	15	-1.1	1.1
146	432	65	59	N-E	33 2 2.525	71 27 37.048	2	13	16	-2.0	1.3
146	620	65	16	N-E	33 2 2.705	71 27 35.448	2	22	10	-2.2	0.2
*146	638	63	41	N-E	33 2 2.475	71 27 47.528	3	13	1	-2.4	10.8
146	656	90	23	S-E	33 1 54.125	71 27 34.928	2	22	15	-0.7	-1.8
146	618	63	22	N-E	33 2 2.445	71 27 36.488	2	25	12	-2.2	-0.2
146	840	99	40	S-E	33 1 58.925	71 27 37.688	2	24	9	-1.6	1.1
*146	1026	64	59	N-E	33 2 1.685	71 27 35.068	2	34	17	-1.2	0.3
*146	1100	54	7	N-E	33 1 45.125	71 27 30.248	7	2	0	-15.4	-6.5
*146	1126	42	10	N-E	33 2 2.705	71 27 35.708	2	15	5	-2.2	-1.1
145	1214	64	16	N-E	33 2 1.685	71 27 36.428	2	24	12	-0.3	2.0
141	1244	64	64	N-E	33 2 1.925	71 27 37.708	2	34	16	-1.6	2.0
*146	1312	62	84	N-E	33 2 2.765	71 27 45.328	13	24	0	-2.3	12.5
145	1432	56	16	N-E	33 2 3.305	71 27 37.288	2	23	10	-2.9	7.7
*146	1500	42	11	N-E	33 2 2.105	71 27 37.688	3	15	7	-1.6	1.3
145	1526	65	59	S-E	33 1 58.085	71 27 34.988	2	32	0	-1.8	-1.7

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 21E-1  
ARITHMETIC MEAN SOLUTION, VALPARAISO, BIRTH NO. 4.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
3P	12	25	33 2 0.485 71 27 35.72W	1.5 1.6	0.7 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS		DEVIATION <10 SECS OF ARC
			<15	>75	
142	2328	X			
143	258	X			
143	326	X			
143	512		X		
143	710		X	X	
143	858	X			
143	920	X			
143	1106				X
146	638				XX
146	1100	X		X	X
146	1126	X			X
146	1312		X	X	X
146	1500	X			X

TABLE 21C-1

BY SATELLITE, MEAN SOLUTION, VALPARAISO, BIRTH NO. 4.

SATELLITE	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	4	33 2 0.405 71 27 37.49W	0.8 2.1	0.4 1.1
54	7	33 2 0.415 71 27 36.15W	0.8 1.8	0.3 0.7
63	1	33 1 56.705 71 27 33.32W		
64	5	33 2 0.345 71 27 37.92W	0.5 2.0	0.4 0.9
65	3	33 2 0.345 71 27 34.72W	0.8 1.8	0.5 1.0
99	5	33 2 0.345 71 27 35.82W	0.9 2.0	0.4 0.9

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TABLE 22A-1  
P/V KAKA KEOKI 1974 POSITIONAL DATA BALBOA, PANAMA  
MOORED TO NORTH SIDE OF PIER NO. 2, RODMAN NAVAL BASE, 75 METERS INWARD.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
167	1930	56	48	N-E	8 52 4.40N	79 34 22.02W	2	30	14	-302.1	-244.0
167	2104	64	31	S-E	8 57 6.54N	79 34 23.34W	3	31	15	-2.3	0.4
*167	2226	56	7	S-E	8 56 55.22N	79 34 24.24W	4	0	0	-10.4	1.3
167	2252	64	25	S-E	8 57 6.72N	79 34 22.39W	2	28	10	-2.1	-1.5
167	2316	42	22	S-E	8 57 7.14N	79 34 22.86W	2	27	13	0.3	-0.2
*168	10	56	77	S-E	8 57 7.62N	79 34 22.02W	2	23	1	0.8	-0.2
168	124	42	32	S-E	8 57 8.46N	79 34 23.15W	2	31	15	1.6	0.3
168	235	46	28	N-E	8 57 9.78N	79 34 22.50W	2	32	15	-0.1	1.9
*168	442	63	12	N-E	8 57 11.40N	79 34 22.50W	2	20	9	4.5	-0.4
168	1432	65	57	S-E	8 57 12.10N	79 34 22.86W	2	22	1	10.2	0.4
168	1616	65	57	S-E	8 57 12.65N	79 34 22.86W	2	22	15	-0.2	-0.2
*168	1758	73	71	S-E	8 57 13.16N	79 34 24.12W	6	21	1	1.3	1.2
168	1824	60	33	N-E	8 57 13.30N	79 34 24.72W	2	28	13	-0.5	1.4
168	2000	60	16	N-E	8 57 13.72N	79 34 24.72W	2	26	9	-0.2	-0.2
*168	2202	64	68	S-E	8 57 14.20N	79 34 21.50W	2	36	17	6.4	-1.2
*168	2228	42	52	S-E	8 56 33.00N	79 34 22.20W	10	0	0	-23.0	-0.2
168	2318	54	36	S-E	8 57 4.16N	79 34 23.82W	2	33	16	1.3	0.9
*169	10	42	79	S-E	8 57 5.34N	79 34 26.58W	2	23	15	1.5	3.7
169	106	54	21	S-E	8 57 7.48N	79 34 22.74W	2	24	13	0.8	-0.2
*169	158	42	7	S-E	8 57 10.26N	79 34 24.00W	5	0	0	4.4	1.1
169	212	65	7	N-E	8 57 13.50N	79 34 25.32W	7	0	0	6.0	2.4
*169	256	65	76	N-E	8 57 17.38N	79 34 25.48W	2	36	0	0.5	-17.0
169	518	63	57	N-E	8 57 18.56N	79 34 25.16W	2	35	17	-2.3	2.8
*169	726	63	12	N-E	8 56 57.24N	79 34 24.14W	2	10	9	-0.6	1.7
*169	944	64	82	N-E	8 57 4.34N	79 34 23.74W	2	24	17	-1.5	0.7
169	1058	54	22	N-E	8 57 4.36N	79 34 24.24W	2	27	12	-0.5	1.3
169	1146	42	50	N-E	8 57 6.24N	79 34 25.80W	2	30	13	-0.6	2.2
169	1244	54	31	N-E	8 57 6.00N	79 34 22.68W	2	31	15	-0.3	-0.2
*169	1234	42	13	N-E	8 57 7.38N	79 34 23.34W	2	19	0	0.5	0.4
169	1529	75	49	S-E	8 57 8.52N	79 34 23.24W	2	22	15	1.7	0.1
169	1716	65	12	S-W	8 57 5.52N	79 34 23.40W	2	16	7	-1.3	0.5
169	1858	63	24	S-E	8 57 8.28N	79 34 23.59W	2	25	11	1.4	0.7
169	2114	64	45	S-E	8 57 7.50N	79 34 22.56W	2	34	16	0.6	-0.3
*169	2228	54	11	S-E	8 57 2.58N	79 34 15.64W	2	17	7	-4.3	-3.2
169	2302	44	16	S-E	8 57 7.38N	79 34 22.56W	2	24	11	0.6	-0.3
169	2320	42	24	S-E	8 57 7.00N	79 34 22.80W	2	18	6	0.2	-0.1
170	14	54	61	S-E	8 57 8.40N	79 34 22.14W	2	31	0	1.5	-0.9
170	100	42	29	S-E	8 57 6.72N	79 34 22.62W	2	30	14	-0.1	0.4
170	308	65	37	N-E	8 57 5.70N	79 34 25.74W	2	15	13	-1.2	2.8
170	450	63	20	N-E	8 57 5.64N	79 34 24.42W	2	26	12	-1.2	1.5
170	424	52	44	S-E	8 57 9.16N	79 34 23.52W	2	34	15	1.1	0.5
170	610	59	18	S-E	8 57 6.72N	79 34 21.96W	2	26	12	-0.1	-0.2
170	654	64	30	N-E	8 57 7.50N	79 34 24.84W	2	30	15	0.6	1.0
170	1042	64	24	N-E	8 57 7.20N	79 34 22.26W	2	29	14	0.3	-0.3
170	1152	54	68	N-E	8 57 3.05N	79 34 0.90W	8	0	0	-3.8	44.0

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 22A-1  
P/V KAKA KEOKI 1974 POSITIONAL DATA BALBOA, PANAMA  
MOORED TO NORTH SIDE OF PIER NO. 2, RODMAN NAVAL BASE, 75 METERS INWARD.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTS0	DEVIATION FROM THE MEAN (IN SECONDS OF ARC)	
										LATITUDE	LONGITUDE
170	1236	42	46	N-E	8 57 6.42N	79 34 20.82W	2	34	16	-0.4	-2.1
170	1400	65	16	S-E	8 57 5.94N	79 34 22.14W	2	20	5	-0.0	0.8
*170	1622	63	8	S-E	8 57 6.78N	79 34 21.54W	2	1	1	-0.1	-1.4
170	1758	93	19	N-E	8 57 6.60N	79 34 23.70W	2	23	10	-0.1	0.9
170	1942	92	27	N-E	8 57 5.64N	79 34 22.00W	2	24	5	-1.2	-2.1
170	2026	64	16	S-E	8 57 5.34N	79 34 22.24W	2	22	7	1.5	0.6
170	2212	64	46	S-E	8 57 8.10N	79 34 23.64W	2	24	3	1.2	0.5
170	2322	54	48	S-E	8 57 9.76N	79 34 23.16W	2	31	12	1.0	0.3
*171	6	42	72	S-E	8 57 8.46N	79 34 26.24W	3	21	0	1.5	12.4
171	114	54	16	S-E	8 57 9.10N	79 34 26.64W	2	21	0	2.4	-0.5
*171	145	42	7	S-E	8 57 9.54N	79 34 26.00W	6	0	0	-3.2	3.1
*171	220	46	41	N-E	8 57 9.24N	79 34 24.72W	4	22	10	-1.2	1.8
171	406	56	41	N-E	8 57 9.28N	79 34 25.62W	2	18	18	0.5	-3.3
*171	546	63	67	S-E	8 57 9.28N	79 34 25.52W	3	12	5	0.0	2.6
171	722	93	74	S-E	8 57 9.15N	79 34 21.24W	3	37	18	2.5	-1.7
*171	656	64	6	N-E	8 57 9.10N	79 34 22.32W	4	11	4	2.4	-0.6
171	652	64	67	N-E	8 57 9.46N	79 34 23.52W	2	35	17	-1.4	-3.1
171	1102	54	20	N-E	8 57 9.24N	79 34 24.30W	2	21	15	-0.6	1.4
171	1144	42	10	N-E	8 57 7.92N	79 34 20.82W	2	34	16	-1.1	-2.1
*171	1722	63	42	S-E	8 57 8.12N	79 34 26.82W	2	27	11	-0.7	8.6
171	2122	64	66	S-E	8 57 2.28N	79 34 17.22W	3	36	17	-4.5	-5.7
171	2232	54	16	S-E	8 57 7.50N	79 34 20.76W	2	24	11	0.6	-2.1
172	16	54	46	S-E	8 57 7.47N	79 34 26.04W	2	34	17	0.9	2.2
172	56	42	27	S-E	8 57 6.54N	79 34 22.80W	2	23	14	-0.3	2.9
172	214	65	55	N-E	8 57 6.54N	79 34 25.64W	2	34	0	-0.3	2.9
172	458	63	25	N-E	8 57 5.28N	79 34 23.82W	2	31	14	-1.6	0.9
172	556	59	29	S-E	8 57 7.86N	79 34 23.24W	2	32	15	1.0	0.3
172	644	53	25	N-E	8 57 6.80N	79 34 22.14W	2	29	14	-2.1	-1.8
172	740	59	20	S-E	8 57 7.44N	79 34 21.56W	2	32	15	0.6	-0.9
172	904	64	44	N-E	8 57 5.24N	79 34 24.00W	2	33	15	-1.6	1.1
*172	1014	54	8	N-E	8 57 14.16N	79 34 27.12W	6	1	3	4.2	4.2
172	1050	42	16	N-E	8 57 7.14N	79 34 23.24W	2	10	2	0.3	0.4
172	1156	54	70	N-W	8 57 5.34N	79 34 22.07W	2	34	19	-0.5	-0.9
172	1234	42	42	N-B	8 57 6.24N	79 34 21.42W	2	33	16	-0.6	-1.5
172	1450	65	25	S-E	8 57 7.74N	79 34 22.04W	2	27	12	0.9	-0.1

\* = FIX NOT USED FOR COMPUTATION OF THE MEAN

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TABLE 22B-1  
ARITHMETIC MEAN SOLUTION, PANAMA, FODMAN PIER NO. 2, NORTH SIDE.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
81	26	56	8 57 6.86N 79 34 22.90W	1.3 1.6	0.2 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION	ITERATIONS	DEVIATION
		<15	>75	>25
167	1930			x
167	2226	x		
168	10		x	
168	442	x		
168	1432			x
168	1748	x		
168	2228	x	x	x
169	110		x	x
169	158	x		x
169	212	x		x
169	336		x	
169	726	x		x
169	944		x	
169	1334	x		
169	1716			
169	2228	x		
170	1152			x
170	1622	x		x
171	6			x
171	146	x		x
171	220			
171	518	x		
171	546			x
171	808	x		x
171	1720			x
172	1014	x		

TABLE 22C-1  
BY SATELLITE, MEAN SOLUTION, PANAMA, FODMAN PIER NO. 2, NORTH SIDE.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	10	8 57 6.99N 79 34 22.64W	0.7 1.5	0.2 0.5
54	11	8 57 7.10N 79 34 22.75W	0.8 1.4	0.2 0.4
63	5	8 57 7.13N 79 34 23.45W	0.8 1.3	0.4 0.5
64	12	8 57 7.14N 79 34 22.75W	0.8 1.4	0.2 0.4
65	8	8 57 7.06N 79 34 22.71W	0.8 1.6	0.3 0.5
99	9	8 57 7.07N 79 34 22.78W	0.7 1.5	0.2 0.5

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) As a by-product of the marine scientific program on the oceanographic cruises of the University of Hawaii's research vessels, positions for 34 dock or anchorage sites in and around the Pacific basin were determined using the Magnavox 702(MX 702/hp) Satellite Navigator as a fixed point positioning device. While it is apparent that not all positions were determined to the same accuracy, a significant number represent improvements of 15 seconds or more in the charted positions of islands, ports and harbors in the Pacific		

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20. ABSTRACT (cont.)

basin. Thus this work may prove to be of considerable benefit by establishing a network of well known and well surveyed Doppler determined positions in the Pacific which may serve as geodetic position references. More fundamentally, this study will contribute to the safety of navigation in making land approaches by providing more modern and accurate positional information than can be obtained from charts.